



**DETERMINATION OF THE TRAINABILITY OF  
DECEPTION DETECTION CUES**

THESIS

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DETERMINATION OF THE TRAINABILITY  
OF DECEPTION DETECTION CUES

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### **Abstract**

The Air Force and the rest of the Department of Defense rely on valid information to make National Security decisions. The veracity of the information used to make those decisions can dramatically affect which course of action our military will take. Therefore, it is important that our leaders be able to recognize if they are being deceived. This study examines the results of training five categories of deception cues to 190 Air Force Officers. The officers were tested to determine their baseline deception detection abilities, then trained on the deception cues, Arousal, Emotion, Cognitive Effort, Communicator Tactics, and Memory Processes, then retested to determine how much information they retained. The results of this study show that there is a return on the investment in training deception detection for at least four of the deception cues.

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Chris Ford

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# **DETERMINATION OF THE TRAINABILITY OF DECEPTION DETECTION CUES**

## **I. Introduction**

### **Background**

The word “deception” commonly generates negative connotations, and in some instances, rightfully so. Nobody wants to be deceived. Yet, while the very thought of being deceived stirs animosity in most individuals, those same individuals are probably guilty of using deception on more than one occasion. Hence, the use of deception may be more ubiquitous than commonly known. Therefore, being able to identify when deception is being employed would be an advantage for the common person.

Deception is used in everyday life by most people in events as simple as buying items at a swap meet or garage sale or during the purchase of a car. The buyer, in an attempt to pay the least possible, will intentionally hide how much he is willing to pay; the seller, in an attempt to get the most for her object, will intentionally hide the least she is willing to take. Even in playing “Go-Fish” with our children or poker with our friends, we employ deception; we do not want the other person knowing what is in our hands.

Some would argue that the above examples do not constitute deception because they are expected practices when playing cards or purchasing certain items. In Information Manipulation Theory, McCornack (1992) discusses Grice’s (1989) four maxims of communication which relate to these situations. Grice (1989) explains quality, quantity,

relation, and manner and how they pertain to certain communication categories (McCornack, 1992:5; Grice, 1989:26-27). Quantity refers to the amount of information provided; as much as is necessary and no more. Quality refers to the veracity of the communication; the level to which participants are anticipated to convey truthfulness. The relation maxim refers to participants making their communication contribution relevant to the situation at hand given established constraints. Manner refers to how what is said vice what is said with the expectation that participants will avoid obscurity and ambiguity. While the above examples are generally acceptable forms of deception that fall within the realm of Grice's (1989) four maxims, this research will concentrate on the less acceptable forms of deception in which the offended party is expecting truthfulness and is harmed in some way. More specifically this research is concerned with teaching our military members how to recognize cues that are displayed when deception is being employed.

### **Deception in the Military**

Military strategists have long used deceptive techniques to achieve a tactical advantage. A perfect example of this strategy is how Japan led the United States (US) into believing that Japan was still negotiating restoration of trade embargos, oil supplies from the Dutch East Indies, and peace negotiations with China while the Japanese Fleet was bearing down on Pearl Harbor (Friedrich, 1991:39-41). The US leaders were suspicious of Japan's intentions and knew that they were preparing for war, but thought as long as negotiations were continuing, no hostile action would take place. The

Japanese were successful in lulling the US into a less cautious state of mind than the US would have been had negotiations not been taking place.

The US military successfully used deception during Desert Storm by causing the Iraqi leadership to believe they were going to be attacked directly from Kuwait. General Norman Schwarzkopf sent a major attack body around to the west and north with his famous “Hail Mary” move (Schwarzkopf, 1992:362, 408; Camor, 2002:426). This deception successfully tricked the Iraqi’s into concentrating their defenses in the south. Although there is little doubt the US would have won a direct assault, this deception may have saved numerous American lives.

In the process of deceiving, most people unconsciously and indeliberately transmit evidence of their intent to deceive in the form of cues (Buller, 1994:209). One would think that warning an individual of the potential for deception would increase vigilance and ability to detect deception; however, research has not supported this claim. Primed interviewers were no better at detecting deception than the unprimed (Toris and DePaulo, 1984:1063-1073). However, the primed interviewers were more suspicious of even the honest interviewees. The limitation to this study, according to the interpretation of this literature review, is that the “primed” interviewers were not trained at deception detection, merely informed to be aware of deception.

## **Problem**

This research evaluated the effectiveness of teaching deception cues to study participants. There were five categories of cues evaluated: arousal, emotion,

communicator tactics, cognitive effort, and memory process. Although most people believe they are good at detecting deception, they are actually only correct slightly more than half the time (Cao, et al(b), 2003:1; Feeley & Young, 2000:105; Stiff et al, 1992:326; Zuckerman, et al, 1984:519). One could make almost as accurate a determination as to whether he was being deceived or not by a simple coin toss. Therefore, for national security reasons, it is in the best interest of the military services to teach their members how to recognize deception cues.

Military members, leaders especially, must be able to recognize deception cues. In a meeting between Great Britain's prime minister, Neville Chamberlain, and Adolf Hitler, Hitler's ability to deceive gave him the upper hand. While Hitler was mobilizing his troops in preparation for attacking the Czechs, he needed to convince Chamberlain that peace was possible between Germany and Czechoslovakia. Hitler was stalling for time and needed Chamberlain to convince the Czechs that peace was possible to keep the Czechs from building their forces. Hitler's deceit was successful and Chamberlain reported to Parliament that Hitler "means what he says." (Ekman, 1985:15-16) Although rudimentary by today's standards, this is a good example of the need for us to recognize deception cues. Had Chamberlain recognized that Hitler was lying, history may be different today.

Previous research has resulted in development of a computer-based training (CBT) system to train deception cues. In a 2002 study, the effectiveness of the CBT was compared to that of the instructor lecture method for teaching individuals how to recognize cues that indicate deception was being employed (Lankowski, 2003; Dzubinski, 2003; Knod, 2003; Rockwell; 2003). It was discovered that the CBT was

at least as good as, but not significantly more effective than that of instructor lecture. The CBT has since, however, been improved with a more interactive option that permits the student to conduct keyword searches, ask the software questions, and navigate through the lecture curriculum to either repeat portions or skip portions the student feels he is familiar with.

### **The Research Question**

By learning to recognize Burgoon's (in press) deception cues, one should improve their accuracy in detecting deception. According to previous research, training deception detection cues via CBT proves to be at least as and possibly slightly more effective than live instruction (Lankowski, 2003; Dzubinski, 2003; Knod, 2003; Rockwell; 2003). The above two assertions leads to the following research question: Which deception cues, amongst Burgoon's (in press) five categories of cues, are effectively trained via CBT?

The rest of this research paper examines the research question above in great detail. Chapter two of this paper involves an extensive literature review to ascertain what is already known of the subject of deception detection, the use of CBT, and the use of third-party observations in training scenarios. Chapter three discusses the research methodology used to determine which deception cues are best trained using the CBT. Chapter four explains the results of the data obtained during the research experiment. Chapter five is an in-depth analysis, explains the implications of the analysis, and discusses the scope and limitations of the use of the new knowledge discovered as a result of this study.

## **II. Literature Review**

### **Overview**

This chapter reviews and summarizes much of what is already known about deception detection. Studies conducted in the area of deception date back to 1920 (Burgoon, 1994:208). Burgoon referenced Marston (1920) regarding changes in vocalic patterns during deception. Although the relevance of earlier studies is clearly important to continued work in the field, there was an explosion in interest in deception detection with a subsequent increase in the number of studies during the 1980s and 1990s (Buller and Burgoon, 1994a; Ekman, 1985; Burgoon, 1990; Zuckerman, Koestner, and Alton, 1984; Meyer, 1992; Burgoon et al, 1992)

This research examines five distinct yet closely aligned categories of cues used in deception detection: Arousal, Emotion, Communicator Tactics, Memory Process, and Cognitive Effort. The research will all be conducted via CBT. This research also uses a third party for determining whether or not deception has occurred. Therefore, this literature review also examines previous research conducted in the use of CBT and third-party observations.

### **Defining Deception**

To begin a study of deception detection, the definition of deception must be examined. Definitions of deception detection cover a range of behaviors. Some of the generally accepted meanings of deception are:

- The act of deceiving, cheating, hoodwinking, misleading, or deluding



- The fact or condition of being deceived, fooled, or deluded
- A characteristic, arrangement, or situation that deceives or deludes with or without calculated intent (Webster, 1961)

In addition to the dictionary definition of deception, most scholars who study deception posit their own definition. Two scholars who have done extensive research in the area of deception detection, Buller and Burgoon (1994a:192), define deception as “the intent to deceive a target by controlling information (e.g., transmitting verbal and nonverbal messages, and/or manipulating situational cues) to alter the target’s beliefs or understanding in a way that the deceiver knows is false.”

Ekman (1985:28) has a simpler definition of deception. He defines a liar and deceiver the same: a person that intends to mislead another. He continues that deceit is a deliberate act and codifies deceit into two categories: falsification and concealment. Concealment is passive deceit, requiring no action, no construction of a story or lie. Falsification, on the other hand, is active deceit. It requires the deceiver to construct a lie and attempt to persuade the receiver that the deceiver’s rendition is the truth. Concealment often appears to be the preferred method of deceit because it

- Lessens the impact on the deceiver should the truth be discovered
- Is considered less reprehensible than falsification
- Requires no memorization, as falsification does, to maintain consistency

Further research from Burgoon and Buller (1994:155) defines deception as “...a deliberate act perpetrated by a sender to engender in a receiver beliefs contrary to what

the sender believes is true to put the receiver at a disadvantage.” For the purposes of this study, the relatively simple definition of deception is that of *knowingly conveying an untruth to another*.

## **Deception Cues**

Now that the definition of deception has been explored, the next step is to examine what cues reveal the possibility that deception is being employed. A deceiver’s behavior can inadvertently reveal his deceit. (Buller & Burgoon, 1994:209) People deceive for multiple reasons. One could tell a “white lie” to spare someone’s feelings (i.e., “I love your new hairdo”) or tell a complete fabrication to save his life (i.e., telling a police detective, “I didn’t kill the man.”) The intent of the lie, the level of deception involved, and the consequences of being discovered invoke varying emotional states that may reveal themselves through the individual’s behavior (Burgoon, 1990:357-365). It must be clearly understood that many of the cues or behaviors being observed are brought on by emotional responses (Buller & Burgoon, 1994: 209). These emotional responses could be due to the individual being deceptive, or those responses could be for a variety of other reasons that invoke emotional responses. The sender could be upset, nervous, or excited due to a situation completely removed from the communication at hand. Hence, the observation of the cues discussed later does not necessarily indicate deception. In fact, a truth teller will begin to display these cues when he perceives that the receiver believes he is lying. If the receiver then falsely interprets the new behavior, he will only

become more suspicious. This incorrect interpretation is referred to as the “Othello Error” (Ekman, 1985:132).

Ekman (1985:39) defines *deception clues* as indicators that the deceiver is not being truthful, and *leakage* as indicators that reveal the truth. Depending on the study, the author may use clues or cues. This paper will refer to them all as cues unless directly quoting another author. Leakage or deception cues may be displayed in a variety of ways; a change in facial expression, change in tone or rate of speech or breathing pattern, verbal mistakes, or long pauses between words (Ekman, 1985:43).

When a wife asks her husband if he thinks she looks fat and he avoids eye contact and insists that she is not, he may be demonstrating leakage. The avoidance of eye contact suggests that he does think she looks fat, but he does not want to say so. On the other hand, if she asks what he wants for dinner and he again avoids eye contact while saying, “anything you fix will be wonderful dear,” the avoided eye contact again may indicate deceit, but in this case we do not know what he wants. He may want something very specific, or he may just be sick of the meatloaf he has had every night for a week.

An earlier study found that learning deception cues was a matter of learning which cues consistently distinguish between truth and deception (Zuckerman, Koestner, and Alton, 1984:520-526). This study found that training can significantly improve the “human lie detector”, and when feedback was added to practice sessions, accuracy improved to 70 percent. They also found that despite fatigue and reduced concentration, accuracy improved between the first half of the test to the second half. They purport that

the improvement is possibly due to getting additional practice from the first half of the test and what should have been learned through training was actually learned through practice during the test.

With various combinations, according to one study, up to 700,000 deception cues are possible (Schrunk, 1975:37). With that many possible cues, it is extremely difficult to watch for them all. Some examples of cues are choice of words, expressions gestures, head movements, posture, sweating, flushing, etc. The most commonly watched cues are the choice of words and those involving facial expressions respectively (Ekman, 1985:81-82). Since they are the most commonly watched, they are also the cues that are the most often attempted to be controlled. Because there are many ways a deceiver may display cues, this review will categorize them into word choice, facial expressions, other verbal expressions, and other nonverbal expressions.

### **Word Choice**

The deceiver knows that his words are being listened to, and that his choice of words can make a difference in the success or failure of his attempted deceit (Ekman, 1985:87-91). If the deceiver has had time to prepare and/or rehearse his lie, he may choose better words. However, if he has not had time to prepare the lie, he is more apt to be inconsistent in the story told, use inappropriate words for the discussion, or repeat words or phrases, all in an attempt to gain more time to create his fabrication.

Meyer (1992:240) also breaks deception down into those who have been able to practice and those who have not. The deceiver who must make up lies on the fly

provides brief but tentative answers to questions, has more silent pauses, uses meaningless phrases such as “like that” and “you know” as a more polished verbal pause, uses more absolute words such as “always” and “never”, and fails to provide important or obvious details. Whereas the prepared deceiver provides more immediate answers to questions and those answers are more often terse answers.

### **Facial Expressions**

Second only to chosen words, the face is the most frequently watched and manipulated feature when it comes to deception (Ekman, 1985:123-161). Some facial cues are lip biting or sucking, cheek puffing, feigned smiles, and the raised eyebrow. Many facial expressions are easily controllable, but there are some muscles or features that most people cannot control. The most common uncontrollable muscles are in the forehead and eyebrows. Blushing and blanching are also features of the face that are virtually uncontrollable. These features of the face are more likely to show the deceiver’s true emotions.

There are also micro expressions. A micro expression is one that is displayed for less than a quarter of a second, but it is usually a full facial expression that may briefly reveal a person’s true feelings (Ekman, 1985:129). Squelching is similar to a micro expression, but it only involves part of the face and it usually lasts longer.

The eyes have their own deceptive cues. The controllable eye features are the direction of gaze of the eyes and the muscles around the eyes (Ekman, 1985:141). The muscles around the eyes control the shape of the eye and how much of the white and iris

of the eye is showing. Some eye features that are not controllable with certain emotions are pupil dilation, blinking, and tearing.

### **Other Verbal Cues**

Many verbal cues are not necessarily one's choice of words. Many verbal cues can be displayed through other, sometimes uncontrollable, voice idiosyncrasies (Ekman, 1985:92-98; Meyer, 1992:240-245). Some of these cues can be pauses (too long or frequent), verbal pauses such as "um" or "aah", stumbling over words (stuttering), a rise in the pitch of the voice, a change in rate of speech, tremors in speech, or flat/monotone speech with no emotion. These behaviors could all be cues to deception, or they could just be the way the person talks. So the key to use of these cues to detect deception is to listen for changes in the person's normal speech patterns.

### **Other Nonverbal Expressions**

Perhaps the most overlooked method of detecting deception is the monitoring of body movements (Ekman, 1985:98-114; Meyer, 1992:240). As previously stated, the most watched areas are those of choice of words and facial expressions. Since those areas get the most attention, deceivers tend to neglect the possibility that the rest of their body may be spewing deception cues. Some bodily deception cues are fidgeting, toe tapping, hair twirling, scratching or picking, lip biting, covering the mouth, touching the nose, ring twisting, and concern over how clothes are fitting. The alert deceiver may be aware of these cues and take actions to limit them. Some other cues that are not as controllable are changes in breathing patterns, heart rate, swallowing, and sweating.

In Schrank's (1975:36-41) studies of detecting deception, he posits that ninety percent of all communication is nonverbal. Hence, kinesics, the language of gesture, is where most deception will be revealed. Some of the gestures he discusses are the hand-to-chin movement, hands clasped behind the head, hair grooming, gazing at the ceiling, rubbing the nose, forming a steeple with the hands, sitting with folded arms, and talking with a hand over the mouth.

Meyer (1992:240), in his separation of prepared and unprepared deceivers, notes that the unprepared deceivers also tend to nod their heads at the end of a lie and lack enthusiasm indicating that they had indeed rehearsed. Although it would take hundreds of hours of practice to become even moderately effective at reading the estimated 700,000 possible combined gestures, a few hours of studying the most obvious and common gestures will aid one in becoming better at detecting deception in communications (Schrank, 1975:41). This section has briefly discussed word choice, facial expressions, other verbal cues, and other non-verbal expressions as indicators of deception. The next section discusses how and why those cues are exhibited.

### **Categories of Cues Taught**

Burgoon (in press) has categorized the above cues into Arousal, Emotion, Cognitive Effort, Memory Process, and Communicator Tactics. This research will use those categories of cues to train people on deception detection techniques. These categories of cues use a variety of the above-mentioned cues as will be described.

## **Arousal**

Arousal is the affect of the body physiologically reacting to excitement, fear, or some other type of stimulation, usually the result of a high-stakes situation (Burgoon, in press). The high-stakes situation could be an individual lying to preserve their job or to stay out of jail. “White lies” to preserve ones feelings are not usually a high-stakes situation. The cues that will “leak out” of an individual in a high-stakes situation are usually beyond the deceiver’s control. Some examples of arousal cues are a rigid, still, stiff, or over controlled posture; dilated pupils; lip pressing; nervous self-touches such as nail biting, hair twirling, or picking on one’s own skin; clearing of the throat; coughing; rise in speaking pitch; slowing of speaking tempo; hesitations or restarts of sentences, and more general nervousness (Buller & Burgoon, 1994:211; Burgoon et al, 1992:163; Burgoon, in press; Ekman, 1985:114).

## **Emotion**

Emotional cues are often brought about by feelings of guilt or anxiousness related to the fear of being caught lying. Although closely related to arousal, arousal can occur without emotion, whereas emotions must have some degree of arousal (Burgoon, in press). Some cues related to emotional leakage are showing fleeting or micromomentary expressions of fear, anger, disgust or anxiety; feigned smiles; less emotion in voices; monotone pitch; less facial pleasantness; less cooperative demeanor; and forced or nervous laughter (Buller & Burgoon, 1994: 209; Burgoon, in press; Ekman, 1985:33-35).



## **Communicator Tactics**

Evidence of communicator tactics is the result of deceivers employing strategies and associated tactics to achieve a successful deception. Unlike the other four categories of cues, communicator tactics are purposeful behaviors employed by the deceiver to achieve deception (Burgoon, in press). The other four categories examined in this study typically involve involuntary or accidental behaviors. Some of these Communicator Tactics cues are designed to distance the deceiver from the story by using equivocation and ambiguity; also known as nonimmediacy. The deceiver is trying to persuade his listener that the deceiver's version is truthful. Therefore, the deceiver is aware that he will have to use different behaviors depending upon the situation. When the deceiver has had time to organize and plan out his deception, his communication may have the appearance of being rehearsed, planned and thoughtful. In further attempts at this deception, he may become more assertive or dominant to exhibit an air of confidence. However, when asked a question he had not planned for, he may use brevity in his response to avoid presenting obviously false information. Hence, the deceiver's tactics may have an either fight or flight approach. The fight being more assertive and engaging, and the flight being submissive or withdrawn. In longer deceptions, initial rigidity and over-control of behavior may succumb to a more relaxed behavior as the deceiver becomes comfortable in his deceit. Additionally, initial unpleasantness may succumb to increased pleasantness such as smiling and facial pleasantness and vocal pleasantness. Other indicators of Communicator Tactics cues are longer response latencies, vocal uncertainty, and less nonverbal immediacy and involvement (Burgoon, in press).

## **Memory Process**

Memory Process cues are the result of deceivers having to conjure up a story.

Truth-tellers have real memories and they can relate rich details. Deceivers must take the time to create a story and since it is not real, the story will generally lack the richness and details of a real story. The reduction in details expressed by the deceiver corresponds to less vocalization or talk time exhibited by deceivers. A person accessing actual memories shows greater expressivity and punctuated head movements, therefore, a person conjuring up a story would display less of these characteristics (Burgoon, in press).

## **Cognitive Effort**

Deception is usually more difficult than telling the truth. This difficulty reveals itself through cognitive effort cues. However, cognitive effort cues may be limited especially if the deceiver has had time to plan and rehearse the deception or in the case of written deception, having the opportunity to edit content before sending the message. Some cues that would indicate cognitive effort are the deceiver having difficulty coordinating his verbal and nonverbal expressions (i.e.: saying a food is delicious while grimacing); avoiding eye contact; temporarily stopping natural gestures when speaking; speaking slower; having more pauses and errors in speech; and short and monotone responses to questions. (Schrunk, 1975:39; Burgoon & Buller, 1994:176) Under high-stake situations, deceivers will use fewer filled pauses and non-ah non-fluencies, but under low-stake

situations deceivers use more filled pauses and non-fluencies (Burgoon, in press). This fluctuation in cues makes this a difficult category to master.

### **Use of Cues**

Buller and Burgoon (1994:369) codify deception into three types of deception:

- Falsification: most conversationally and informationally complete
- Equivocation: least conversationally and informationally complete
- Concealment: withholding information

Their codification adds one more category to Ekman's categories. Equivocation is a sort of middle of the road between concealment and falsification. Equivocation contains no deviation from honesty (Buller and Burgoon, 1990:397), just a lot of ambiguity and room for misinterpretation. Although falsification is generally the more studied form of deception, equivocation may be the more practiced form of deception.

Buller and Burgoon's (1994:378-391) research found that deceivers generally are more kinesically expressive; nodded less yet had more random movement; were considered less formal and more withdrawn, possibly in an attempt to suppress deception cues and reduce the likelihood of being caught; and were less pleasant. Additionally, Buller and Burgoon noted different behaviors depending on the relationship with the receiver. If the receiver was a stranger, the deceiver was conversationally less dominant yet overall more dominant, more reticent, displayed less kinesic tension, and altered their behavior less. Yet, another study found that deceivers swiveled more in their chairs,

spoke slower, used more present tense verbs and less past tense verbs, spoke longer, used more group references, more modifiers, and less self references (Ebesu and Miller, 1994:418-442). Burgoon and Buller (1994:173) found that deceivers had greater nonimmediacy and reticence, vagueness and uncertainty, arousal and nervousness, negative affect, and communication incompetence. They also avoided gaze and gave briefer answers.

One study has shown that when individuals are first exposed to truthful behavior, deceptive behavior is more successfully detected (Zuckerman, Koestner, and Alton, 1984:519). The deception; however, is generally detected through body cues instead of the usually watched facial cues. This earlier discovery has been further supported by Burgoon, et al (1994:267). They found that deviations from typical communication patterns may be the single best indicator of deception attempts. For example, although speaking in a monotone voice is an indicator that someone may be lying, some people speak monotonically on a regular basis. Therefore, looking for a change in speech pattern is a more accurate method of determining whether that person is being truthful (Zuckerman et al, 1984:519; Feeley & Young, 2000:102).

Burgoon and Buller (1994:160) codified deception into two further categories: strategic and nonstrategic communications. Evidence of strategic communication is vagueness/uncertainty, withdrawal/reticence/nonimmediacy, disassociation, and image-protecting behavior. These strategic communications are also known as information management, behavior management, and defensive maneuvers because they are less committed towards deception; rather they are an attempt to foster a poised, friendly

relationship with the receiver to allay suspicion. Nonstrategic communication behaviors are more common deceptive displays such as leakage, arousal and nervousness cues, negative affect cues, and incompetent communication performances.

The interpersonal detection theory (IDT) posits that socially skilled people are better able to deceive and avoid detection (Burgoon, et al(b), 1994:289-295). By the same token, IDT conveys that socially skilled people are better at detecting deceitful behavior. Socially skilled senders will alter their behavior based upon their perceived feedback from receivers. If they feel they are not being completely successful in their deceit, they will change their behavior in an attempt to deceive better. On the other hand, socially skilled receivers will hide suspiciousness in an attempt to make the sender comfortable to possibly acquire more deceptive cues or contradictory information.

The motivation impairment effect (MIE) says that when speakers are more motivated, their verbal deception skills will improve, but their nonverbal skills will be impaired. Burgoon and Floyd (2000:258-262) conducted a study which contradicted the MIE findings. They found that contrary to those previous findings, motivation did not negatively affect nonverbal performance by deceivers; motivation was rarely associated with inhibited verbal or nonverbal performance.

This literature review argues that the aforementioned cues are valid characteristics to use in a determination as to whether or not deception has occurred. While each cue is a valid indication of possible deception, the observer of the cue must weigh the entire communication and determine if expression of that cue is out of character for the sender

to make an educated judgment as to whether or not the sender is being deceptive. Learning these cues may seem overwhelming, but it is the intent of this study to determine if CBT assists in this learning process.

### **Third-Person Observation**

This research examined the ability of study participants to accurately evaluate whether or not deception was employed between two other individuals in a previously recorded scenario. As such, the study participants are third-party observants. Several studies indicate significant differences in how senders, receivers, and observers interpret the same interactions (Burgoon, et al, 1994:264; Guerrero, L, 1994:125-140). Since the actors (sender and receiver) are involved in cognitively intensive communication, they may miss or misinterpret behaviors of the other. In general, the participants determine the other's communication to be more favorable than an outside observer.

In one study, an independent observer was watching a college professor interview one of his students (Ekman, 1985:100). In support of the study, the instructor was intentionally making it a stressful interview. During the interview, the student unintentionally and indiscriminately gave the instructor the finger. When the observer informed both the professor and the student what was observed, they both denied that it happened. When the observer showed them a videotape of the incident, they were both shocked. Not only does this incident support the third-person observer, but it also supports theory that deceivers exhibit cues unintentionally.

Burgoon, et al (1996:735-737) conducted an extensive study on the issue of sender, receiver, observer interpretations on communications. They found that receivers did not recognize changes in sender's verbal message or nonverbal behaviors when shifting from truthful to deceptive messages. One of the reasons Burgoon points out why the receiver may not notice the shift from truthfulness to deception is because, according to IDT, he enters the conversation with a very strong expectation for honesty. Another reason the receiver may not notice the shift is because he may be too busy coordinating his own communication. Planning communication involves extensive cognitive effort which may hinder one's ability to interpret an interaction.

The experiments for this research use a third-person observer to make a determination as to whether or not deception was employed. The previous research discussed in this section indicates the use of third person observers are better at evaluating individual behaviors than one directly involved in the situation (Burgoon, et al, 1994; Guerrero, L, 1994; Ekman, 1985; Burgoon, et al 1996). The literature contains many examples of studies on use of the third-person observer, validating the decision to use a third-person observer for this research.

### **Computer-Based Training (CBT)**

Note that much of the literature reviewed for this research used the term Computer Based Instruction (CBI). For consistency purposes, this paper will use CBT in place CBI. As previously discussed, this research compared the results of traditional instruction with that of CBT. CBT often offers the learner more control (choices in

practice level, time spent on each task, and level of attention at particular points) over the learning process which can be critical a determinant of training effectiveness (Brown, 2001:271). While CBT may be appealing, some studies have shown that giving the learner control may hinder learning (Brown, 2001:281). The learners may skip critical practice sessions, or move quickly through training in an attempt to get it over with. According to Brown, some of the students with the worst Post-test scores completed less than 70 percent of the practice sessions and spent less than six hours on a 14-hour program.

Communication richness is the ability to communicate information while overcoming ambiguity or difficult ideas without losing the meaning of the information (Daft and Lengel, 1986:560). The media the communication uses is referred to as media richness. The better the media is able to transfer the intended communication without degradation, the richer the media. Daft and Lengel (1986) rate several types of media in decreasing richness starting with face-to-face communication. This is the richest because it allows immediate feedback and observance of body language, nonverbal, and verbal cues. The other media evaluated are telephone, personal documents, impersonal documents, and numeric documents. Since their study was completed prior to the proliferation of computers, CBT and CD-ROMs were not evaluated.

According to a more recent study, 87 percent of companies with at least 100 employees have used CD-ROMs for training (Kaupins, 2002:319-322). This particular study investigated the effectiveness of six objectives that CBT was attempting to train. Those objectives are knowledge acquisition, problem solving, participant acceptance,



changing attitudes, interpersonal skills, and knowledge retention. Television lectures scored lowest for most objectives, while the highest rated methods were role-playing, games and conferences. The latter methods offer more of a face-to-face type of communication which Daft and Lengel (1986) rate as highest in media richness; hence, the not so surprising results that those methods were more effective.

These results support previous studies that suggested that adults learn more effectively through active training methods and application of knowledge based on real-life events. Kaupins (2002) finds mixed results between a 1999 study that found no significant differences between online and offline sections of the same courses, and a 2000 study that student's attitudes toward Web courses were more favorable with students who were more experienced with the Web. A 2003 study found that training via CBT resulted in at least as good as and slightly better than results from live instructor training (Lankowski, 2003; Dzubinski, 2003; Knode, 2003; Rockwell; 2003).

Web courses can provide a variety of participation through videos, interactive videos, online chats, and audio. Of the twenty different variations of training tested, CD-ROMs placed ninth, and video placed 15<sup>th</sup>. Specifically for knowledge acquisition and retention, CD-ROMs and videos were rated relatively high, but lower for interpersonal skills development. The research conducted in this study compiled the use of video, CD-ROM, and slide presentations in the development of the CBT. In the context of this research, deception detection training would be considered a mix between knowledge acquisition and retention and interpersonal skills development.

There are mixed results in determining the effectiveness of CBT in the learning process. This is a limitation that will be discussed further in chapter 5 of this research.

### **Agent99 Development**

Recent research in the area of deception detection has resulted in development of the Agent99 Trainer, a Computer Based Training (CBT) system designed to be self-paced and provide immediate feedback to the student. Agent99 is an improvement upon a previously developed system called Learning By Asking (LBA). LBA is a general training tool that provides the flexibility of web-based technology while providing the media richness of multimedia technology. LBA provided explicit learning instruction, but lacked practice and feedback; two critical components of learning deception detection. The three components together, explicit learning instruction, practice, and feedback are the three core components of learning deception detection. Therefore, to complete the triad, researchers added the “View Example with Analysis” module which provided scenarios that users could practice with and obtain feedback on their judgments as to whether deception was employed. The addition of the “View Example with Analysis” to the earlier designed LBA is the Agent99 Trainer (Cao et al(b), 2003:2-3).

### **Previous Agent99 Research**

The previous study that this research will be continuing compared Agent99 with instructor lecture training methods. This previous study used 120 Air Force Officers in Basic Communication Officer Training (BCOT) at Keesler Air Force Base (George, 2003:1; Lankowski, 2003; Dzubinski, 2003).

Each method used identical curriculum to ensure effective examination of the training method without the corruption of differing training material. The curriculum, based on what was found to be effective in previous studies, included a videotaped lecture, communication scenarios, and analyses for each scenario (Cao, et al(a). 2003:3).

The curriculum as detailed above significantly improved deception detection (Cao, et al(a), 2003:7). While the study showed no significant improvement using the Agent99 Trainer over instructor lecture methods, Agent99 was proven to be at least as effective as instructor lecture methods. One reason for the weaker than expected performance may be that the Agent99 software was not fully functional. An interactive option of the Agent99 Trainer was still in development at the time of the study. This interactive option affords the opportunity for students to perform keyword searches and ask the CBT questions and receive answers (Cao, et al(a). 2003:7).

## **Hypotheses**

With the Agent99 Trainer now fully functional, this study examines the level of effectiveness for training of each of the five categories of deception cues. This study uses the Agent99 Trainer to teach students how to detect deception cues. The students are tested on their ability to detect cues first to develop their baseline abilities. They are then instructed, via Agent99 Trainer, then tested again to determine if their detection abilities improved. The expectation is that students' ability to detect deception will improve after receiving training via the Agent99 Trainer. This scenario leads to the following five hypotheses:

Given that people will unintentionally display certain deception cues due to a physiological reaction to excitement, fear, or some other type of stimulation, there is a general expectation that those cues can be taught and learned. The common cues associated with deception due to arousal, such as rigid, still, stiff, or over controlled posture; dilated pupils; lip pressing; nervous self-touches such as nail biting, hair twirling, or picking on one's own skin; clearing of the throat; coughing; rise in speaking pitch; slowing of speaking tempo; hesitations or restarts of sentences, and more general nervousness (Buller & Burgoon, 1994:211; Burgoon et al, 1992:163; Burgoon, in press; Ekman, 1985:114).

*H1: Training via Agent99 Trainer will improve the detection of Arousal cues to indicate that deception is being employed.*

Since people may have anxiety about lying or a fear of getting caught lying, they may display those fears with emotionally related deception cues. Some of the common emotion cues that would be displayed are showing fleeting or micromomentary expressions of fear, anger, disgust or anxiety; feigned smiles; less emotion in voices; monotone pitch; less facial pleasantness; less cooperative demeanor; and forced or nervous laughter (Buller & Burgoon, 1994: 209; Burgoon, in press; Ekman, 1985:33-35). It is expected that it is possible to train people to recognize these cues.

*H2: Training via Agent99 Trainer will improve the detection of Emotion cues to indicate that deception is being employed.*

Purposeful behaviors employed by a deceiver are intended to conceal that they are being deceptive or to distance themselves from the story (Burgoon, in press). Some Communicator Tactics cues that may be displayed in the course of a deception are aggressive and engaging or submissive and withdrawn behavior, terse responses to questions, initial unpleasantness switching to pleasantness, more silent pauses, longer response latencies, vocal uncertainty, and less nonverbal immediacy and involvement (Burgoon, in press). With training, it is expected that individuals will be able to learn these cues.

*H3: Training via Agent99 Trainer will improve the detection of Communicator Tactics cues to indicate that deception is being employed.*

In the process of making up a story, deceivers generally do not convey detailed richness that one would convey in the conveyance of a truthful situation. In conveying a false story, a deceiver may use less vocalization or shorter talk time due to the fact that he is providing less detail than would be provided from an actual memory. He may also show less expressivity and reduced head movements during the deceit (Burgoon, in press). It is expected that one could learn to be cognizant of these behaviors with training.

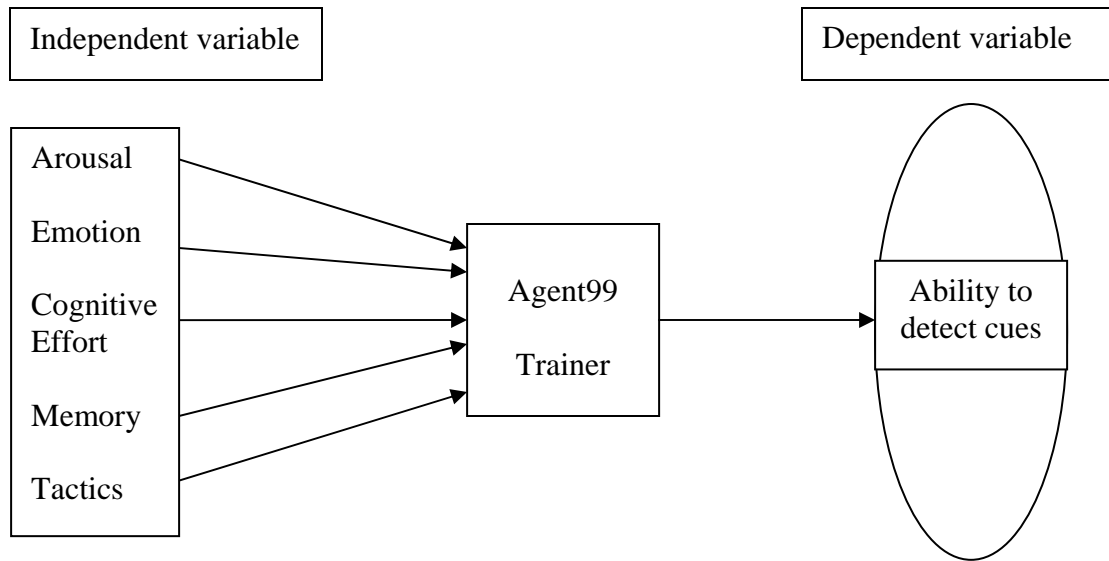
*H4: Training via Agent99 Trainer will improve the detection of Memory Process cues to indicate that deception is being employed.*

The difficulty in attempting to make deception appear to be truthful generally causes discrepancies in the deceiver's verbal and nonverbal behavior (i.e.: saying a food is

delicious while grimacing). Some other indicators of Cognitive Effort cues are avoiding eye contact; temporarily stopping natural gestures when speaking; speaking slower; having more pauses and errors in speech; and short and monotone responses to questions. (Schrunk, 1975:39; Burgoon & Buller, 1994:176) One complication with recognizing Cognitive Effort cues is some of the cues reverse depending upon whether it is a high or low stakes situation (Burgoon, in press). Despite the difficulties, one should be able to learn Cognitive Effort cues and how to use them.

*H5: Training via Agent99 Trainer will improve the detection of Cognitive Effort cues to indicate that deception is being employed.*

The constructs and measurement tools are defined in Figure 1 below. The Agent99 Trainer will be the tool used to train individuals to recognize the deception cues listed in the independent variables. The ability to detect cues after training is conducted is dependent upon the effectiveness of the Agent99 Trainer.



**Figure 1: What is being measured and how?**

The table indicates the deception cues of Arousal, Emotion, Communicator Tactics, Memory Process, and Cognitive Effort as independent variables. With training via the Agent99 Trainer, an increase in one's ability to recognize the presence of these cues is expected. Study participants should improve their knowledge of the cues that indicate deception and should be able to put that knowledge into practice by accurately assessing when deception has been employed.

### **III. Methodology**

The previous chapters described the research problem, provided relevant background information, and reviewed previous research results in the areas of deception detection, third-person observations, computer-based instruction, and the Agent99 Trainer. This chapter discusses the methodology employed in the experiment for this research.

#### **Population**

The experiments were conducted on an Air Force installation using 192 Air Force officers in initial training as Communications Officers. In support of research being conducted to evaluate the effects of media richness on training deception detection, the participants were divided into five groups. All participants had at least a bachelor's degree and some may have had advanced degrees. Table 1 delineates the study group's demographic data.



**Table 1: Demographics of population**

<b>Demographic Variable</b>	<b>n</b>
<i>Gender</i>	
Male	159
Female	37
<i>Rank</i>	
2Lt	177
1Lt	4
Captain	5
Major	2
Lieutenant Colonel	0
Civilian	2
Unspecified	6
<i>Education</i>	
Bachelor's Degree	174
Master's Degree	14
Doctoral Degree	0
Unspecified	6
<i>Age</i>	
Average (years)	26.7
<i>Years in Communications Career Field</i>	
Average (years)	2.2

## Research Methodology

The research method chosen for this research was a quasi-experimental nonrandomized control group pretest-Posttest design (Leedy and Ormrod, 2001:241). An experiment was chosen to examine this research over other research options because the purpose of the study is to determine if instruction causes an improvement in the ability to detect deception. The basic purpose of an experiment is to determine a cause and effect relationship (Leedy and Ormrod, 2001:229). For this research the cause is training, the effect is expected to be an improvement in the ability to detect deception. The students were divided into five distinct groups for a concurrent study which evaluated five different levels of media richness provided by the Agent99 Trainer which will be

explained later in detail. The experiment will be a quasi-experiment because the group selection could not be completely random due to the way the students' were already grouped for their class assignments (Leedy and Ormrod, 2001:237). The students were grouped based on which class they were assigned to for their military training and that class was determined by the Air Force Personnel Center and when they arrived for training. Since their class assignment was beyond the control of the experiment, it is considered a "quasi" random experiment. Each student was assigned a four-digit number for tracking purposes. The four-digit number was used for comparing Pre and Posttests and matching demographics to the results. The first digit of the four-digit tracking number indicated which group the student was assigned to.

Group one received linear instructor lecture-only training via previously recorded video presented via CD-ROM. The training is linear in that the student did not have the ability to control the sequence of the training. Group two received linear training via Agent99 Trainer. The difference between the training group one and group two received is that group two received power point slide presentations along with the lecture. Agent99 also displayed the transcript the instructor was working from below the video of the instructor. Group three received Agent99 non-linear training with the ability to ask a question (AAQ). Non-linear training indicates that the student can control the sequence of the training. The AAQ option provides the student the opportunity to type in a question and a built in search engine provides appropriate answer options. In addition to AAQ, there is a keyword search option. The keyword search option is more of a Boolean search and provides a list of more generic responses. Figure 2 depicts a capture of the

actual screen the student sees. The bottom left hand corner of the screen is where the student has the option of selecting AAQ or Keyword search.

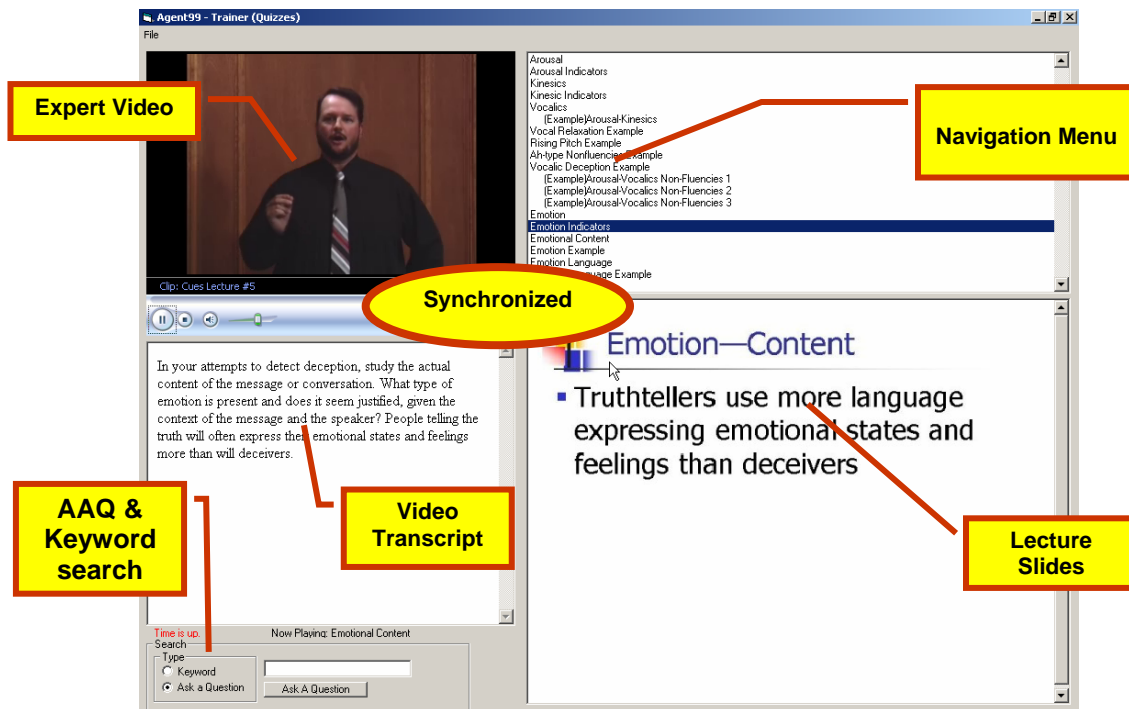


Figure 2: Screen shot of Agent99 showing AAQ and Keyword search

Group four received Agent99 non-linear training, with AAQ, and additional content. Group five received Agent99 non-linear training, with AAQ, with additional content, and with embedded pop-up quizzes.

Each group received different instructions based on the version of the software they were to receive. Groups one and two were told they would receive an introduction, Pretest, instruction, and then a Posttest. They were also told approximately how long the instruction would last. Groups three through five received additional instruction. They were told they had the option to move to different parts of the lecture after the introduction and Pretest portions. They were also told they could ask a question or insert

a keyword search, the difference being that ask a question used algorithms to find an answer and the keyword search was a simple Boolean logic search.

The cues covered in the literature review, word choice, facial expressions, other verbal expressions, and other nonverbal expressions are all employed in one way or another in the five categories (Arousal, Emotion, Cognitive Effort, Memory Process, and Communicator Tactics) examined for this research. The students' ability to learn to recognize these cues is what was measured for this study. Since all students received the same instruction, regardless of their group, they all had equal opportunity to be exposed to the categories of cues to be evaluation in this research.

## **Measurements**

The experiment measured the initial ability of each student to accurately detect deception. Two separate sessions were used with a 3 to 7 day separation between the two for purposes affiliated with, but beyond the scope of this research. However, the experimental design used for the other study lends itself to be used for the purposes of this study. In Session one, their ability was measured by a question/answer knowledge test and a judgment test where each student viewed a recorded scenario and determined whether or not deception was employed in the scenario. The students were then presented with approximately a fifty-minute presentation on recognizing deception cues. As previously stated, each group received the presentation in different formats. After the presentation, each student again took knowledge and judgment tests. Between three and seven days later, depending on BCOT class schedules, the students received Session two. Due to scheduling problems, only 187 students were able to return for the second session.

Session two consisted of the same format of knowledge and judgment tests with additional instruction between the Pre and Posttests. Session one's instructions consisted of general deception detection theory and history of the study of deception detection. Session two's instruction consisted of detailed explanation of the categories of cues and ways to recognize deception.

The training received by the participants was the treatment; tests were the observations. All five groups had an initial observation (O) to determine their deception detection base-line knowledge and skills. They then received treatments (T) as indicated above. Table 2 details the chronology of the experiment. (Leedy and Ormrod, 2001:238)

**Table 2: Treatment and Observations**

All Groups	O	T	O
Three to Seven	Day	Break	
All Groups	O	T	O

## **Measurement Methods**

The student's ability to accurately assess whether or not deception was being employed was determined via a set of ten scenarios presented to them on the CBT. These scenarios consisted of simple text of written discussions and two-person interviews with audio and video or with just audio. An example of a textual scenario is shown in Appendix B. The students examined the scenario and made a simple judgment as to whether or not deception was employed. Then their accuracy between Pre and Posttests were compared to determine whether they made any significant improvement.

## **Test Development**

The test scenarios were developed by scholars at the University of Arizona for use within a broad range of areas within the deception detection arena. While this research is specifically examining which cues are easier trained, the tests used for this research were not developed specifically for that purpose. They were developed for other areas related to deception detection.

## **Permission to Conduct Experiment**

Given this study involved the topic of deception, the experiment was reviewed by the Human Subjects Review board. An exemption to AFI 40-402 was requested and granted by the Air Force Research Laboratory Human Effectiveness Directorate; approval number F-WR-2003-0081-E.

## **Research Environment**

The experiment was conducted in a single classroom in the same building in which the BCOT students attend their military training. The classroom consisted of 16 student computers and one instructor computer. The student computers were lined up along three walls of the classroom so that all the students faced the wall when participating in the experiment. The classroom atmosphere left much to be desired in the way of taste as one would expect in a typical military training environment. It was essentially a bare-boned room with only the necessities and no esthetically pleasing qualities. Certain parts of the classroom were uncomfortably cold due to location of air conditioning vents. The students used computers that were slightly dated, yet fully

capable of handling the software used in the study. The students were also supplied a pair of headsets in which to listen to the audio portions of the experiment.

### **Experiment Administrators**

The experiment was administered by two Air Force Institute of Technology (AFIT) Master's students and a researcher from the University of Arizona (UA). The researcher was primarily present to ensure the software ran smoothly; he had limited student interaction and provided no mass instruction to the students. The AFIT students were both initially present for every stage, but as software problems were debugged and the logistics of running the experiment became simpler, they alternated presence in the classroom. After it was determined that the software was running smoothly, the UA researcher departed.

## IV. Data Analysis

### Overview

The previous chapter described the methodology used for this research. This chapter explains actual events during execution of the experiment, analyzes the quantifiable results of the experiment, and discusses those results in detail.

### Experimental Events

The experiments conducted in support of this research were with the cooperation of the BCOT faculty, staff, and students. The overall population size for this experiment started with 192 students for the first session and dropped to 187 for the second. Since the students were divided into five groups, there was still concern and a struggle to obtain enough students to ensure a large enough sample size for each group. The group sizes were broken down as follows:

**Table 3: Breakdown of Groups and Sessions**

	Session 1	Session 2
Group 1	32	30
Group 2	44	44
Group 3	30	30
Group 4	45	42
Group 5	41	41

Between Sessions one and two, two students from group one and three students from group four could not return for various reasons. Since the experiment consisted of a Pre and Posttest during each session, value was gained from those five that could not return for the second session. Therefore, the results of those five individuals were not discarded.



The students were previously assigned to classes based on their arrival date for training. The classes were supposed to be limited in size to sixteen students; however, in one instance, eighteen students arrived and in another, seventeen students arrived. Yet, in another session, only two students arrived due to lack of volunteerism. Despite previous scheduling to ensure a smooth progression from group one through group five, numerous scheduling conflicts and software problems arose that required flexibility in assignment of students to groups. This was necessary to ensure an adequate sample size for each group. A complete breakdown of how the students arrived follows:

**Table 4: Numbers of students by group and session**

	Session 1				Session 2			
Group 1	14	7	1	10	13	7	10	
Group 2	6	12	13	13	6	12	13	13
Group 3	14	16			14	16		
Group 4	18	12	15		17	11	14	
Group 5	10	2	17	12	12	17	8	4

As students arrived for training, they signed in using sequentially assigned numbers to maintain continuity between sessions and for documentation of demographics. In one class, six students mistakenly signed in using a different group's numbers. Their numbers were manually changed after data collection to ensure validity between groups. Those students were informed of their number change to ensure consistency across sessions.

## **Data Analysis**

In order to determine whether training had any impact on the students' abilities to detect deception, the type of cues category used in each scenario containing deception

had to be determined. Since researchers at the University of Arizona had previously constructed the scenarios, their determination of which cues were displayed in each deceptive scenario was used. Table 5 below indicates which Pre and Posttest questions each category of cues was used in. Pre1 and Post1 indicate the tests in Session one and Pre2 and Post2 indicate the tests in Session two.

**Table 5: Which test questions were the cues in?**

	<b>Pre1</b>	<b>Post1</b>	<b>Pre2</b>	<b>Post2</b>
<b>Arousal</b>	1	4	1,4,6,10	3
<b>Emotion</b>	6,7,8,9		2,5	
<b>Tactics</b>	2,3,4,5,9	7,8,9	3,4,8,9,10	1,4,7,10
<b>Mem Process</b>	9,10	2,3,5,6,10	6,7	2,4,5,6,8,9
<b>Cognitive Effort</b>	1		7,8	5

The table reveals some discrepancies in the distribution of cues among the Pre and Posttests. For example, in Session two, Arousal was presented in four Pretest questions, but in only one Posttest question for Session two. There were no Posttest questions that employed Emotion as a deceptive cue in either of the sessions. Memory Process deception cues, in Session one, were in two Pretest and five Posttest questions, and in Session two, in two Pretest and six Posttest questions. Cognitive Effort, in Session one, was in one Pretest and zero Posttest questions, and in Session two, two Pretest and only one Posttest question. These discrepancies were due to the fact that the questions were not developed specifically for the purposes of this research, but were developed for use in a variety of other deception detection studies not examined in this study.

### Average Cue Score

Tables 6 and 7 further show the discrepancy in the distribution of the cues in Session one's Pre and Posttests respectively. These tables also show the average score obtained by the 192 students on each question by cue. The highlighted scores indicate those scenarios where the communication was truthful.

**Table 6: Session One Pretest**

Question Number	1	2	3	4	5	6	7	8	9	10
Arousal	0.363									
Emotion						0.574	0.247	0.600	0.637	
Tactics		0.532	0.700	0.726	0.721				0.637	
Mem Process									0.637	0.505
Cognitive Effort	0.363									

**Table 7: Session One Posttest**

Question Number	1	2	3	4	5	6	7	8	9	10
Arousal				0.489						
Emotion										
Tactics							0.821	0.679	0.626	
Mem Process		0.768	0.879		0.442	0.142				0.505
Cognitive Effort										

Tables 8 and 9 below show the discrepancy in the distribution of the cues for Session two in the Pre and Posttests respectively. These tables also show the average score obtained by the 187 students on each question by cue.

**Table 8: Session Two Pretest Scores**

Question Number	1	2	3	4	5	6	7	8	9	10
Arousal	0.724			0.876		0.643				0.486
Emotion		0.432			0.795					
Tactics			0.784	0.876				0.784	0.708	0.486
Mem Process						0.643	0.665			
Cognitive Effort							0.665	0.784		

**Table 9: Session Two Posttest Scores**

Question Number	1	2	3	4	5	6	7	8	9	10
Arousal			0.314							
Emotion										
Tactics	0.67			0.854			0.957			0.205
Mem Process		0.276		0.854	0.789	0.714		0.459	0.919	
Cognitive Effort					0.789					

The average scores from each Pre and Posttest were again averaged to obtain an average score for each cue on each Pre and Posttest. For example, the six Posttest scores from Memory Process in Session two were averaged to obtain one mean score for Memory Process on Posttest2. The Pre and Posttest averages were then compared individually for each session to obtain a delta. Table 10 below indicates the average scores for each cue by Pre and Posttest.

**Table 10: Average score by cue**

	Pre1	Post1	Pre2	Post2
<b>Arousal</b>	0.3632	0.4895	0.6955	0.3135
<b>Emotion</b>	0.5145		0.6135	
<b>Tactics</b>	0.6632	0.7088	0.7276	0.6716
<b>Mem Process</b>	0.5711	0.5474	0.6541	0.6685
<b>Cognitive Effort</b>	0.3632		0.7243	0.7892

As discussed earlier, there are no Posttest scores for Emotion in either session and no Posttest score for Cognitive Effort in Session one.

### **Deltas between Pre and Posttest**

Once the averages were computed for each cue in each Pre and Posttest, the differences were then computed to discover whether the students' abilities to detect deception improved after training. The differences are shown in Table 11 below. There is no difference in Emotion because the Emotion cue was not present in any Posttests. There is no difference indicated for Cognitive Effort in Session one because this type of cue was not present in the Session one Posttest.

**Table 11: Delta between Pre and Posttests per session**

	Session 1	Session 2
<b>Arousal</b>	0.1263	-0.3820
<b>Emotion</b>		
<b>Tactics</b>	0.0456	-0.0559
<b>Mem Process</b>	-0.0237	0.0144
<b>Cognitive Effort</b>		0.0649

The deltas represented above are within each session, not across sessions. As shown, in Session one, the ability to detect Arousal and Tactics cues increased slightly, while the ability to detect Memory Process cues decreased slightly. In Session two, the opposite

occurred. The ability to detect Arousal and Tactics cues decreased after training, while the ability to detect Memory Process and Cognitive Effort cues increased slightly.

Performing the same analysis without the truthful questions yields only slightly better results; however, it is a more valid analysis since this research is not attempting to determine false positives, only the ability to determine if training improves the overall accuracy in the ability for students to detect deception. Table 12 below shows the deltas when the truthful scenarios are disregarded.

**Table 12: Deltas disregarding truthful scenarios**

	<b>Session 1</b>	<b>Session 2</b>
<b>Arousal</b>	0.1263	-0.3676
<b>Emotion</b>		
<b>Tactics</b>	0.0263	-0.1514
<b>Mem Process</b>		0.1351
<b>Cognitive Effort</b>		0.0649

In Session one Arousal and Tactics again had a slight improvement after training. Without the truthful scenarios, there were no pretest questions for Memory Process and no Posttest questions for Cognitive Effort. In Session two, Arousal and Tactics again showed a slight decrease in ability to detect deception and Memory Process and Cognitive Effort showed a slight increase.

The most consistent results were obtained by comparing the Session one Posttest with the Session two pretest with the truthful scenarios discarded. Table 13 below shows these results.

**Table 13: Delta between Post1 and Pre2 with truthful scenarios discarded**

<b>Arousal</b>	0.192
<b>Emotion</b>	
<b>Tactics</b>	0.079801
<b>Mem Process</b>	0.106686
<b>Cognitive Effort</b>	

With this comparison, all measured cues showed at least a slight improvement. There were no data for Emotion and Cognitive Effort due to no Pre and/or Posttest results.

A combined across the board look at the deltas for each cue yields conflicting results. Table 14 below shows each cue and the delta between Sessions one and two and between Session one's Posttest and Session two's Pretest.

**Table 14: Consolidated Deltas with truthful scenarios discarded**

	<b>Session 1</b>	<b>Session 2</b>	<b>Post1- Pre2</b>
<b>Arousal</b>	0.1263	-0.3676	0.192
<b>Emotion</b>			
<b>Tactics</b>	0.0263	-0.1514	0.079801
<b>Mem Process</b>		0.1351	0.106686
<b>Cognitive Effort</b>		0.0649	

The only cues with measurements across all fields are Arousal and Tactics. These two categories of cues show improvement in the Pre and Posttests for Session one and between sessions Post and Pretest, but show a weakening between Session two Pre and Posttest. Memory Process shows improvement in Session two Pre and Posttest and between Sessions one and two Post to Pretest. Cognitive Effort only has one measurement, the Pre and Posttest for Session two, which shows improvement. Analysis

of Variance (ANOVA) tests were conducted on each set that are comparable and are included in Appendix B.

## **Results for H1**

*H1*: Training via Agent99 Trainer will improve the detection of Arousal cues to indicate that deception is being employed.

The ability for students to detect Arousal cues that indicated deception in the scenarios tested fluctuated. Between the Pre and Posttest in Session one, the students average ability to detect deception improved by approximately 12.6%. An analysis of variance (ANOVA) test, in appendix B, shows the difference is significant with  $p = 0.0127$ . The most logical explanation for the increase in the score is that the students learned from the training how to better detect Arousal deception cues. However, the possibility exists that part of the improvement could be due to more obvious cues in the Posttest than in the Pretest. From Session one's Posttest to Session two's Pretest, their ability to detect Arousal cues that indicate deception improved again by about 19.2%. Since there is no training performed between Session 1 Posttest and Session 2 Pretest, the improvement is a little more suspect. However, the training applied before Session 1 Posttest could partially explain the improvement. There may have been a delayed effect in ability to detect Arousal cues. But again, some of the improvement could be explained on the possibility that Session 2 Pretest displayed more obvious cues than Session 1 Posttest. However, the final measurement, Session two's Pretest to the Posttest, showed their ability to detect deception based on Arousal cues decreased by 36.7%. Although clearly significant, the ANOVA shows this at  $p = 0.001$ . This large of a decrease in the



ability to detect Arousal cues contaminates the previous improvements. The decrease could very well be due to the fact that there was only one question in the Posttest compared to two in the Pretest. If that one question in the Posttest presented less obvious cues, with that being the only question to compare to, may explain the degradation in performance. This much of a decrease dwarfs the rather smaller increases achieved earlier in the experiment, however the limited comparison makes the degradation plausible. Therefore, this study finds that *H1* is partially supported.

## **Results for H2**

*H2*: Training via Agent99 Trainer will improve the detection of Emotion cues to indicate that deception is being employed.

Only one test scenario where deception was employed displayed the Emotion cues. Due to insufficient distribution of cues across the tests, not enough results were collected for measurement of the ability to detect deception based on Emotion cues. Therefore, this study finds no evidence to support *H2*.

## **Results for H3**

*H3*: Training via Agent99 Trainer will improve the detection of Communicator Tactics cues to indicate that deception is being employed.

The ability for students to detect Communicator Tactics cues that indicated deception in the scenarios tested fluctuated. Between the Pre and Posttest in Session one, the students average ability to detect deception improved by approximately 2.6%. Although

not a significant improvement ( $p = 0.463$ ), it does show some improvement. Since both the Pre and Posttest consisted of two questions, the most likely reason for the increase is due to learning that took place between the tests. There is still the possibility that there was some improvement due to more obvious cues in the Posttest. From Session one's Posttest to Session two's Pretest, their ability to detect Communicator Tactics cues that indicate deception improved again by about 7.9%. Some of this improvement could be explained by residual learning from Session one's training, but some may be explained by more obvious cues in Session two's Pretest. However, in the final measurement, Session two's Pretest to the Posttest, showed their ability to detect deception based on Communicator Tactics cues decreased by 15%. This is a significant difference ( $p = 0.001$ ); compared to Session one's Pre/Post tests difference. Session two's Posttest consisted of two deceptive scenarios, while the Pretest consisted of four deceptive scenarios. This uneven comparison may explain the degradation in ability to detect deception based on Communicator Tactics cues if the two scenarios in the Posttest were less obvious than the four in the Pretest. Since the only improvement attributable to instruction resulted in no significant improvement and there was significant degradation in ability to detect deception in Session two, this study finds that *H3* is not supported.

## **Results for H4**

*H4:* Training via Agent99 Trainer will improve the detection of Memory Process cues to indicate that deception is being employed.

The ability to detect deception based on Memory Process cues was measured in two of the three possible measurements. Between Session one's Posttest and Session two's Pretest, the students' abilities to detect deception using Memory Process cues improved by approximately 10%. Since there was training conducted before Session one's Pretest, there may have been some residual learning that may have caused the increase in ability to detect deception based on Memory Process cues. Between Session two's Pre and Posttest, the ability to detect deception based on Memory Process cues increased by 13.5%. ANOVA tests show this as significant with  $p = 0.004$ . The most likely cause of the improvement is due to training, however an easier Posttest cannot be ruled out. Because this research shows two consistent significant improvements at the tail end of the experiment, sufficient evidence exists to partially support *H4*.

## **Results for H5**

*H5*: Training via Agent99 Trainer will improve the detection of Cognitive Effort cues to indicate that deception is being employed.

Due to limited distribution of cues across the tests, limited results were collected for measurement of the ability to detect deception based on Cognitive Effort cues. Between Session one's Pretest and Session two's Pretest, there was a 36% improvement in the ability to detect deception based on Cognitive Effort cues. ANOVA test show this improvement as significant with  $p = 0.001$ . The improvement may be explained by the training that took place during Session one, but it may be partially explained by more obvious cues in Session two's Pretest. Between Session two's Pre and Posttests there

was a 6.5% increase in the ability to detect deception. ANOVA tests show this as close to significant with  $p = 0.082$ . The improvement may be due to training, but more obvious cues in the Posttest cannot be ruled out. However, since the Pretest had two deceptive scenarios and the Posttest had only one deceptive scenario, providing more limited exposure to cues during the Posttest, it is more likely that the training had a significant effect. Since there were two improvements in the ability to detect deception based on Cognitive Effort cues, this study finds some evidence to support *H5*.

## V. Discussion, Conclusions and Recommendations

The previous chapter revealed the quantifiable results of the experiment and examined those results in detail. In this chapter, conclusions, recommendations, implications for researchers and managers, and suggestions for future research are discussed based on the results obtained from this experiment.

### Discussion

The overall results of this research show promise. The lack of evenly distributed categories of cues among the questions and the variability between session's Pre and Posttests cause difficulties in conclusions of the results. However, taking that limitation into account permitted a logical diagnosis of the experiment's results. Those difficulties will be discussed later in this chapter.

Table 15 below displays the results of the hypotheses in a consolidated format.

**Table 15: Consolidated hypothesis results**

<b>Hypothesis</b>	<b>Supported</b>
H1: Arousal	Partial
H2: Emotion	No
H3: Communicator Tactics	No
H4: Memory Process	Partial
H5: Cognitive Effort	Supported

Hypotheses one and four were partially supported, hypothesis two and three lacked sufficient evidence for support, and hypothesis five was considered supported. Simply stated, this study indicates that Arousal and Memory Process cues may be able to be taught; Cognitive Effort cues are most likely able to be taught; Communicator Tactics

appears as though it can not be taught, and further study is required to make a determination on Emotion cues. Measurements were made where possible, particularly when comparisons between Pre and Posttests were not possible or were weak due to multiple data points in one compared to more limited data points in another. In these cases it was determined that measurements across sessions would add value to the research being conducted. Extremely conservative interpretations of the results of this study have been made so as not to erroneously link positive results to the training conducted. While the training may have had an impact on or may actually be the sole reason for improvements in students' abilities to detect deception, more rigid experimentation is needed to unequivocally establish that as fact.

### **Limitations**

The largest limitation of this study is the lack of evenly distributed cues category across the Pre and Posttest questions. The uneven distribution spawns uncertainty about the validity of the results of the study. Another limitation is this experiment was conducted with entry-level AF officers in one career field. This significantly limits the generalizability of the research results to the rest of the AF and Department of Defense. A third limitation is the manner in which the research participants were obtained. Although it was on a strictly volunteer basis, new members in the military often feel that volunteering is mandatory. This expectation to volunteer may have led some students to volunteer when they really were not interested. The students that did not volunteer were able to use their time preparing for their next exam or completing an assignment. Therefore, the volunteers may not have had their minds entirely on learning deception

cues, but rather on how they could better be using their time. Lastly, several students commented that they did not know if they answered correctly. Agent99 is supposed to provide immediate feedback, one of the core components to learning, to students to assist them in learning deception cues. Agent99 needs to be reconfigured to ensure that students get the immediate feedback that Agent99 is supposed to provide.

### **Implications for Researchers**

Although deception detection studies are in abundance, there is still a long way to go in determining all the uses and implications. Future researchers should continue studying the cues categories examined in this research. More carefully designed testing scenarios should be developed to further validate the results discovered in this research. The Agent99 Trainer should continue to be evaluated for effectiveness and to determine necessary changes to improve its performance. Study participants' comments (Appendix C) should be reviewed and considered for improvements to the Agent99 Trainer.

### **Implications for Managers**

The results of this study should be used by managers to determine where to direct resources to train deception detection. Based on the results of the experiments, managers should place most of their efforts toward Cognitive Effort cues because those were determined to be the most trainable cues. Secondary efforts should be placed in training of Arousal and Memory Process deception cues to improve employee's ability to detect deception. Managers' use of deception detection abilities could prove useful in counseling subordinates and in brokering business deals.

## **Conclusions and Recommendations**

It is the conclusion of this researcher that three of the five hypotheses examined in this study had at least some evidence to support the finding of an improvement. The study showed that the ability to detect deception based on Arousal cues improved in two of the three measurements taken. The ability to detect Memory Process and Cognitive Effort cues improved in both sections measured for each. The ability to detect deception based on Communicator Tactics showed insignificant improvement in session one and significant degradation in session two. There was insufficient data to determine if the ability to detect deception based on Emotion cues improved after training with Agent99.

The tests used in this study were not created for the specific purpose of measuring an increase in the ability to detect the five cues selected for this research. The unequal distribution of the categories of deception cues among the test questions severely hampered this research. It limited the ability to make comparisons between Pre and Posttests and voided the use of more quantitative statistical analysis. It is recommended that future examination of these cues use scenarios and test questions created with the intent purposes of comparing test results across the five cue categories. This would include ensuring that the cues were evenly distributed across the test scenarios that actually involved deception and ensuring that the cues depicted in those scenarios were presented with consistent clarity.

## **Suggestions for Further Study**

This researcher recommends further study in this area of deception detection. The identification of types of cues can be a valuable tool in determining where to place efforts



and resources in teaching deception detection. If the suggestions above are implemented, further research should yield more valuable results. Additionally, further experimentation should be expanded to include more experienced leaders within the military. The use of entry-level officers may limit the results of the study due to a lack of motivation to learn the deception detection techniques suggested in the curriculum. It is recommended to apply the research to senior level curriculum where senior level officers would see a value in learning the deception detection techniques taught. This could be done for example at Squadron Commander's School or Air War College.

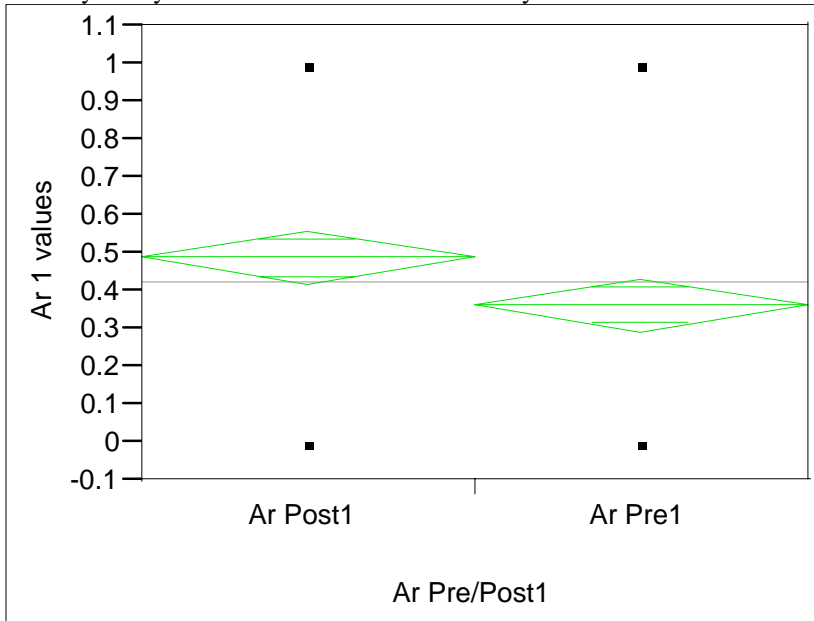
## **Summary**

The use of deception to achieve goals has been used since the serpent deceived Eve into eating the forbidden fruit (Zondervan, 1984:Ge2:10). Deception certainly has its place in military strategy and therefore it is critical that our military leaders develop a sense of when deception is being employed against them and how to use it effectively to gain a military advantage against the enemy (Friedrich, 1991:39-41; Schwarzkopf, 1992:362, 408; Camor, 2002:426). This study examined the effectiveness of training relatively new constructs in the area of deception detection to mostly new junior Air Force Officers. These constructs, Arousal, Emotion, Cognitive Effort, Memory Process, and Communicator Tactics, if effectively learned would permit our military leaders to better determine when deception is being employed against them (Burgoon, in press). This study determined that at least four of those five constructs are trainable to our future military leaders. While the overall study yielded somewhat limited support for the five hypotheses examined, this paper should be used for the improved development of more

useful testing scenarios to further examine the effectiveness of training of the five deception detection category cues.

## Appendix A: Analysis of Variance (ANOVA)

Oneway Analysis of Arousal Session 1 values By Arousal Pre/Post1



Oneway Anova  
Summary of Fit

Rsquare 0.01631  
Adj Rsquare 0.013708  
Root Mean Square Error 0.491787  
Mean of Response 0.426316  
Observations (or Sum Wgts) 380

t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	0.126316	2.503	378	0.0127
Std Error	0.050456			
Lower 95%	0.027106			
Upper 95%	0.225526			

Unequal Variances

	Difference	t Test	DF	Prob >  t
Estimate	0.126316	2.503	377.435	0.0127
Std Error	0.050456			
Lower 95%	0.027105			
Upper 95%	0.225526			

Analysis of Variance

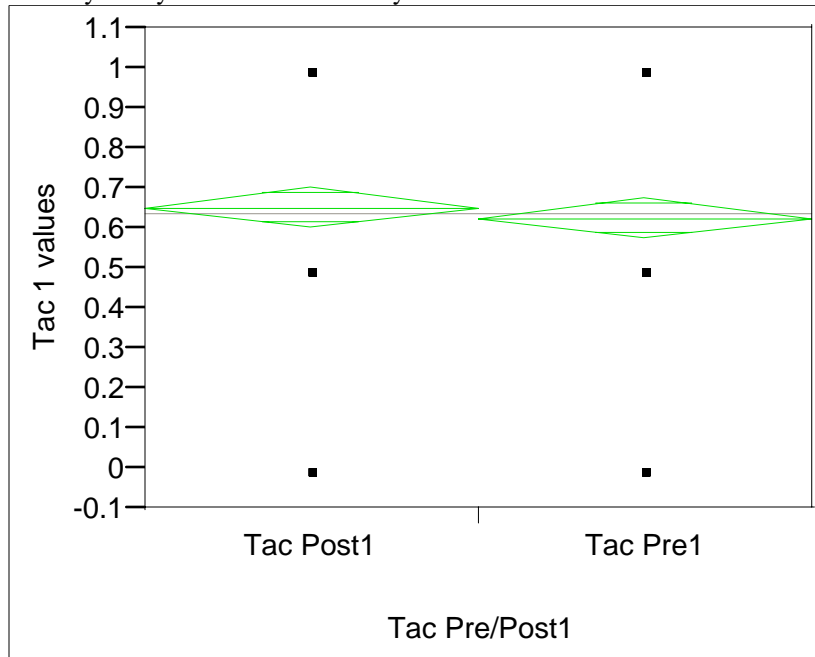
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Ar Pre/Post1	1	1.515789	1.51579	6.2674	0.0127
Error	378	91.421053	0.24185		
C. Total	379	92.936842			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Ar Post1	190	0.489474	0.03568	0.41932	0.55963
Ar Pre1	190	0.363158	0.03568	0.29301	0.43331

Std Error uses a pooled estimate of error variance

# Oneway Analysis of Tac 1 values By Tac Pre/Post1



## Oneway Anova Summary of Fit

Rsquare 0.001427  
 Adj Rsquare -0.00121  
 Root Mean Square Error 0.349005  
 Mean of Response 0.639474  
 Observations (or Sum Wgts) 380

### t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	0.026316	0.735	378	0.4628
Std Error	0.035807			
Lower 95%	-0.04409			
Upper 95%	0.096722			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	0.02632	0.735	376.288	0.4628
Std Error	0.03581			
Lower 95%	-0.04409			
Upper 95%	0.09672			

### Analysis of Variance

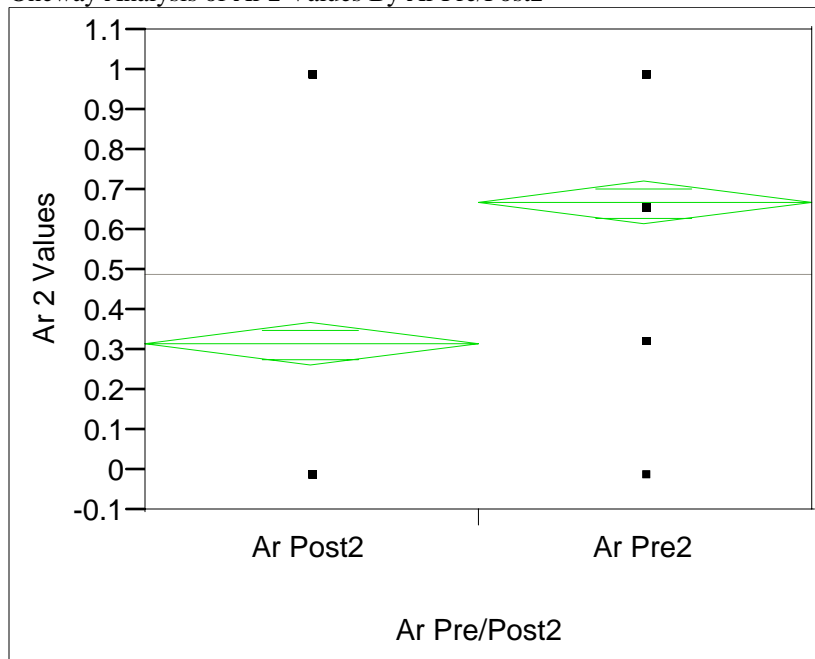
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Tac Pre/Post1	1	0.065789	0.065789	0.5401	0.4628
Error	378	46.042105	0.121805		
C. Total	379	46.107895			

### Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Tac Post1	190	0.652632	0.02532	0.60285	0.70242
Tac Pre1	190	0.626316	0.02532	0.57653	0.67610

Std Error uses a pooled estimate of error variance

# Oneway Analysis of Ar 2 Values By Ar Pre/Post2



## Oneway Anova Summary of Fit

Rsquare 0.189252  
 Adj Rsquare 0.187049  
 Root Mean Square Error 0.368335  
 Mean of Response 0.490991  
 Observations (or Sum Wgts) 370

## t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.35495	-9.268	368	<.0001
Std Error	0.03830			
Lower 95%	-0.43026			
Upper 95%	-0.27965			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.35495	-9.268	271.786	<.0001
Std Error	0.03830			
Lower 95%	-0.43035			
Upper 95%	-0.27956			

## Analysis of Variance

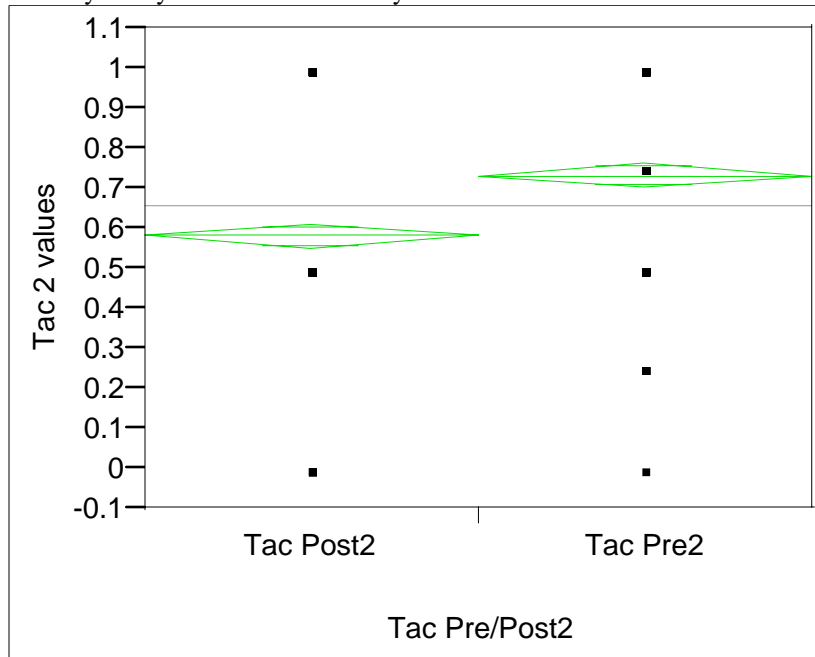
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Ar Pre/Post2	1	11.654354	11.6544	85.9019	<.0001
Error	368	49.926727	0.1357		
C. Total	369	61.581081			

## Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Ar Post2	185	0.313514	0.02708	0.26026	0.36677
Ar Pre2	185	0.668468	0.02708	0.61522	0.72172

Std Error uses a pooled estimate of error variance

# Oneway Analysis of Tac 2 values By Tac Pre/Post2



## Oneway Anova Summary of Fit

Rsquare 0.107789  
 Adj Rsquare 0.105364  
 Root Mean Square Error 0.218314  
 Mean of Response 0.656757  
 Observations (or Sum Wgts) 370

### t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.15135	-6.668	368	<.0001
Std Error	0.02270			
Lower 95%	-0.19599			
Upper 95%	-0.10671			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.15135	-6.668	363.143	<.0001
Std Error	0.02270			
Lower 95%	-0.19599			
Upper 95%	-0.10671			

### Analysis of Variance

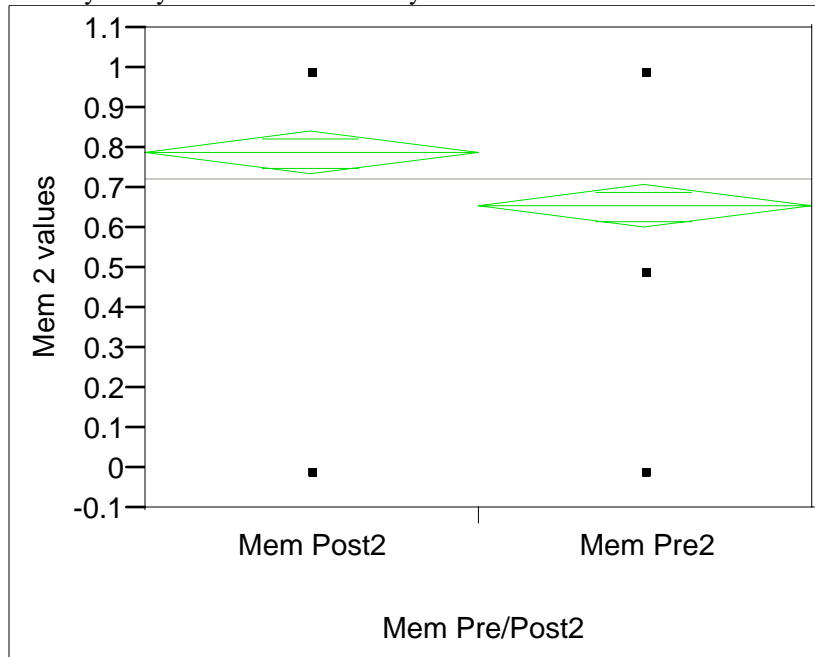
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Tac Pre/Post2	1	2.118919	2.11892	44.4583	<.0001
Error	368	17.539189	0.04766		
C. Total	369	19.658108			

### Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Tac Post2	185	0.581081	0.01605	0.54952	0.61264
Tac Pre2	185	0.732432	0.01605	0.70087	0.76400

Std Error uses a pooled estimate of error variance

Oneway Analysis of Mem 2 values By Mem Pre/Post2



Oneway Anova  
Summary of Fit

Rsquare 0.033234  
Adj Rsquare 0.030607  
Root Mean Square Error 0.365413  
Mean of Response 0.721622  
Observations (or Sum Wgts) 370

t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	0.135135	3.557	368	0.0004
Std Error	0.037994			
Lower 95%	0.060423			
Upper 95%	0.209847			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	0.135135	3.557	345.905	0.0004
Std Error	0.037994			
Lower 95%	0.060407			
Upper 95%	0.209863			

Analysis of Variance

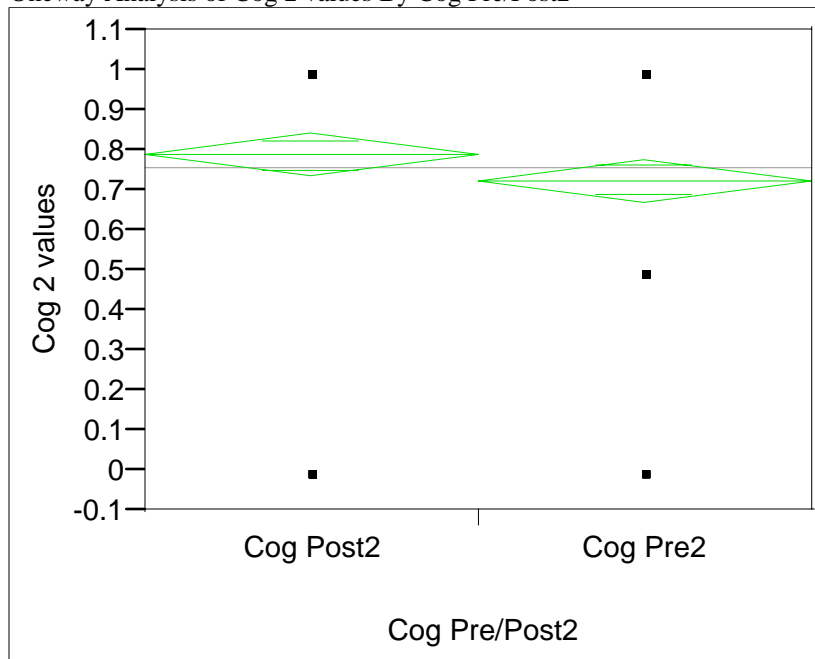
Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Mem Pre/Post2	1	1.689189	1.68919	12.6506	0.0004
Error	368	49.137838	0.13353		
C. Total	369	50.827027			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Mem Post2	185	0.789189	0.02687	0.73636	0.84202
Mem Pre2	185	0.654054	0.02687	0.60122	0.70688

Std Error uses a pooled estimate of error variance

Oneway Analysis of Cog 2 values By Cog Pre/Post2



Oneway Anova  
Summary of Fit

Rsquare 0.008175  
Adj Rsquare 0.00548  
Root Mean Square Error 0.358207  
Mean of Response 0.756757  
Observations (or Sum Wgts) 370

t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	0.064865	1.742	368	0.0824
Std Error	0.037245			
Lower 95%	-0.00837			
Upper 95%	0.138104			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	0.06486	1.742	336.934	0.0825
Std Error	0.03724			
Lower 95%	-0.00840			
Upper 95%	0.13813			

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Cog Pre/Post2	1	0.389189	0.389189	3.0331	0.0824
Error	368	47.218919	0.128312		
C. Total	369	47.608108			

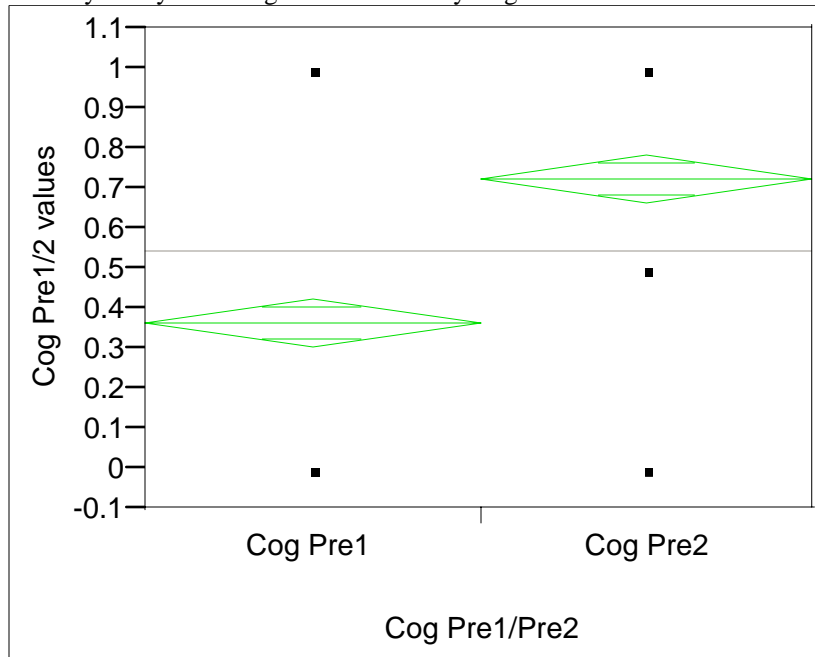
Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cog Post2	185	0.789189	0.02634	0.73740	0.84098
Cog Pre2	185	0.724324	0.02634	0.67254	0.77611

Std Error uses a pooled estimate of error variance



# Oneway Analysis of Cog Pre1/2 values By Cog Pre1/Pre2



## Oneway Anova Summary of Fit

Rsquare 0.16839  
 Adj Rsquare 0.166161  
 Root Mean Square Error 0.402348  
 Mean of Response 0.541333  
 Observations (or Sum Wgts) 375

## t Test

Assuming equal variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.36117	-8.691	373	<.0001
Std Error	0.04156			
Lower 95%	-0.44288			
Upper 95%	-0.27945			

UnEqual Variances

	Difference	t Test	DF	Prob >  t
Estimate	-0.36117	-8.742	316.924	<.0001
Std Error	0.04131			
Lower 95%	-0.44293			
Upper 95%	-0.27940			

## Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Cog Pre1/Pre2	1	12.226688	12.2267	75.5276	<.0001
Error	373	60.382646	0.1619		
C. Total	374	72.609333			

## Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
Cog Pre1	190	0.363158	0.02919	0.30576	0.42055
Cog Pre2	185	0.724324	0.02958	0.66616	0.78249

Std Error uses a pooled estimate of error variance

## Appendix B: Screenshots of Text Testing Scenarios

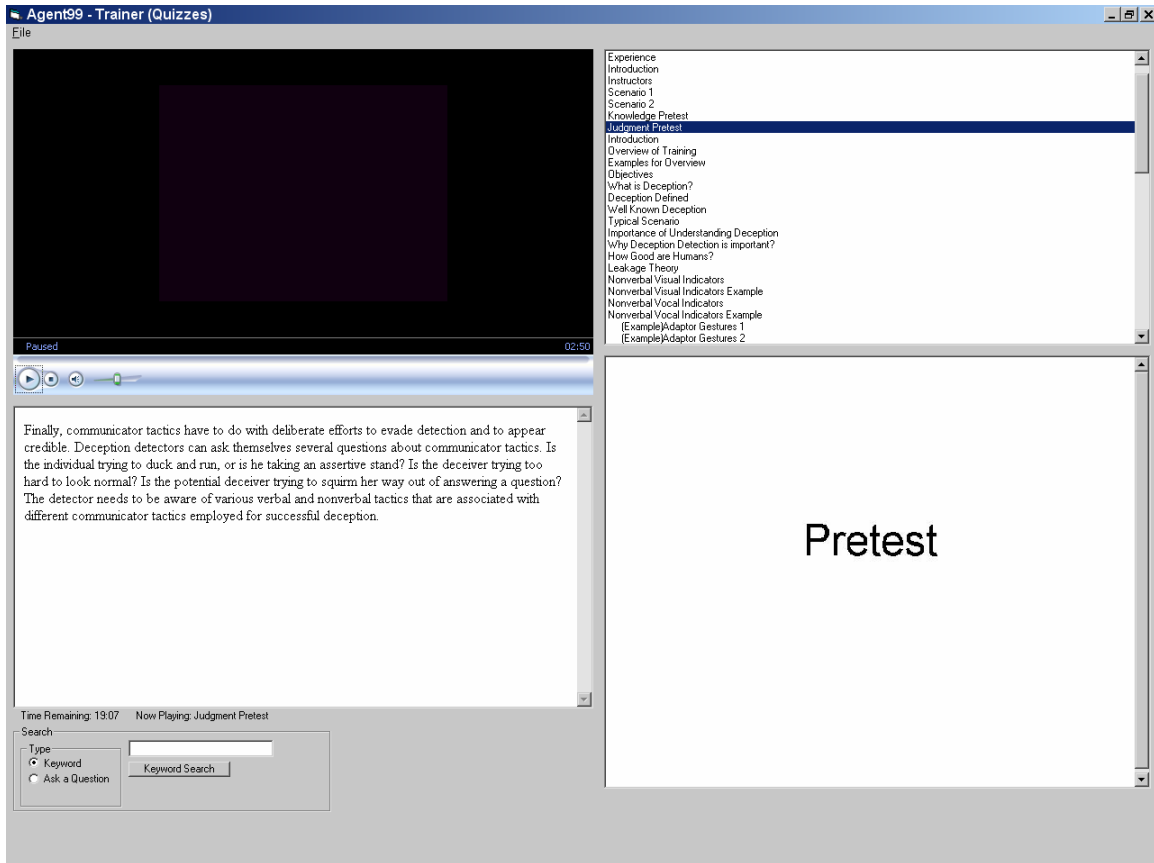


Figure 3: Session One Pretest Screenshot

The screen capture failed to capture the text, so the text is detailed below:

Q: If your best friend was cheating on his or her spouse, and you knew about it, what would you do?

A: .... I was reading something the other day about infidelity. 70% of men will have an affair in their lifetime and 60% of women.....

Q: Hmm, but if you're like I said, if you had a friend that you knew was cheating, what, you know, would you do? What would you do?

A: How close of a friend?

Q: Um, well, uh, your best friend. It's your best friend.

A: Well, it will depend on what was going on in their relationship...

Q: Ok, and let's say that all other things being equal. You find your best friend is being unfaithful, is having an affair, um, what would be your first reaction?

A: I might be a little upset.

Q: And, why would you be upset?

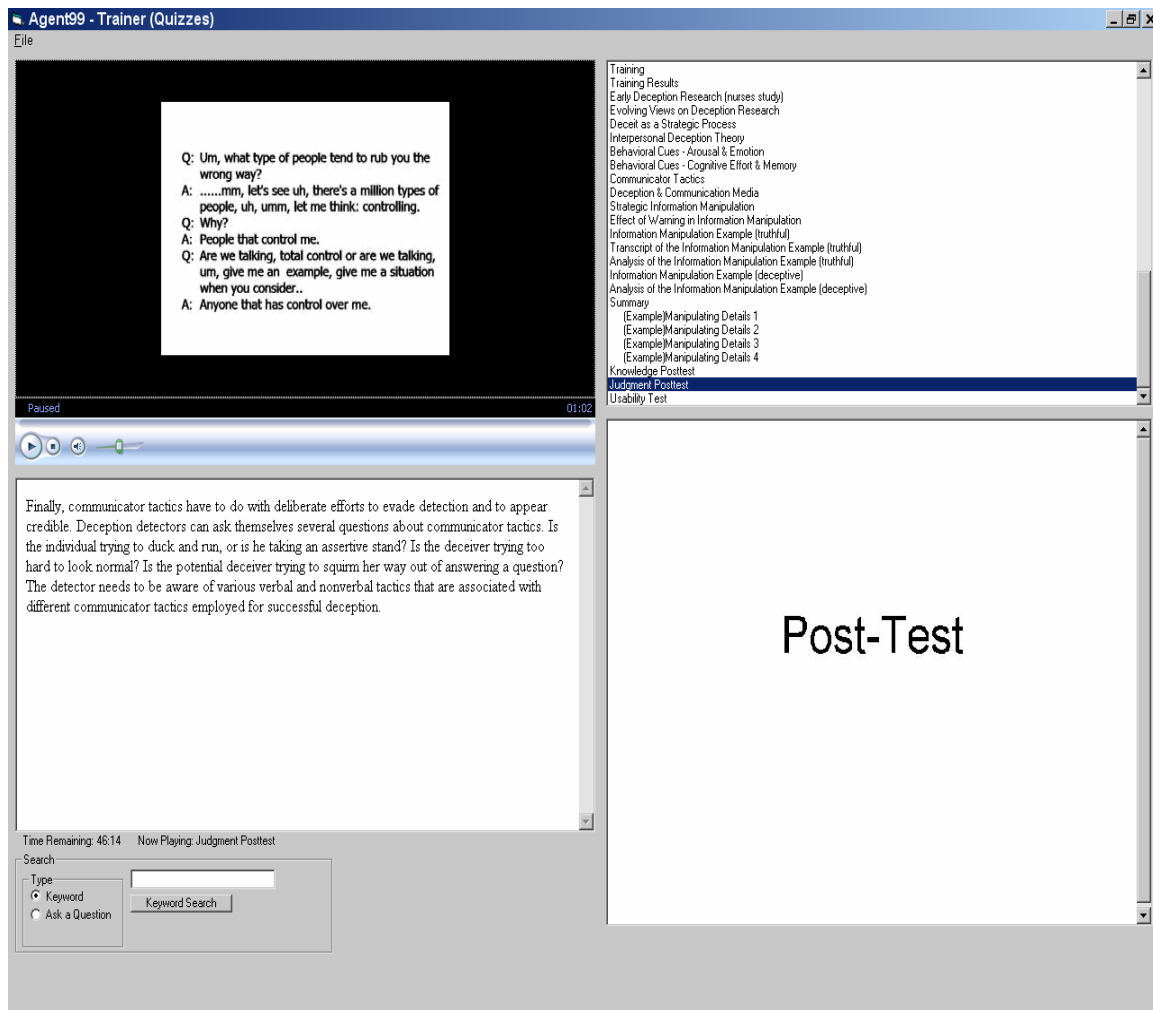
A: Because it's my best friend

Q: Just because it's your best friend, or would it be something else?

A: Because my best friend is involved in an uncomfortable situation.....

Q: Uncomfortable for who?

A: For my best friend.



**Figure 4: Session One Posttest Screenshot**

Below is a transcript of the text:

Q: Um, what type of people tend to rub you the wrong way?

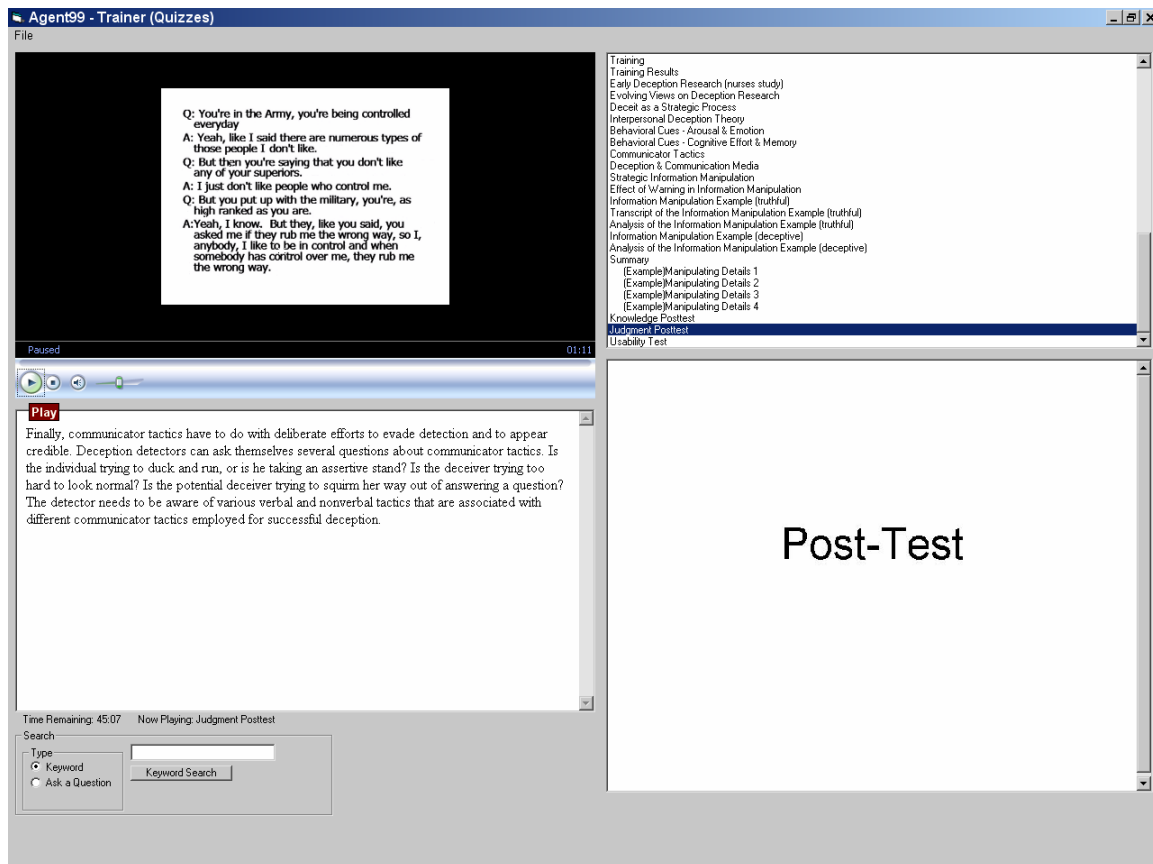
A: ....mm, let's see uh, there's a million types of people, uh, umm, let me think: controlling.

Q: Why?

A: People that control me.

Q: Are we talking, total control or are we talking, um, give me an example, give me a situation when you consider..

A: Anyone that has control over me.



**Figure 5: Session One Posttest Screenshot Page 2**

Q: You're in the Army, you're being controlled everyday

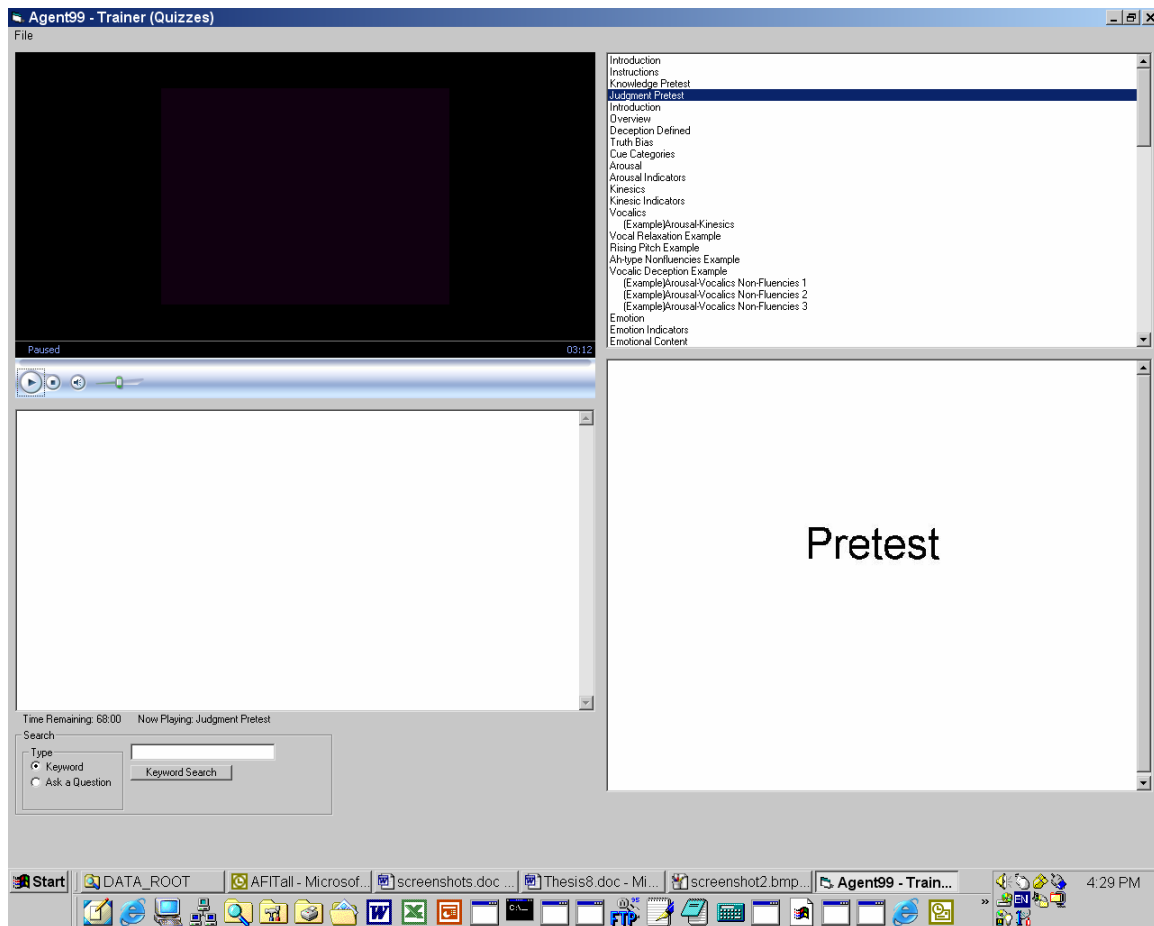
A: Yeah, like I said there are numerous types of those people I don't like

Q: But then you're saying that you don't like any of you superiors.

A: I just don't like people who control me.

Q: But you put up with the military, you're, as high ranked as you are.

A: Yeah, I know. But they, like you said, you asked me if they rub me the wrogn way, so I, anybody, I like to be in control and when somebody has control over me, they rub me the wrong way.

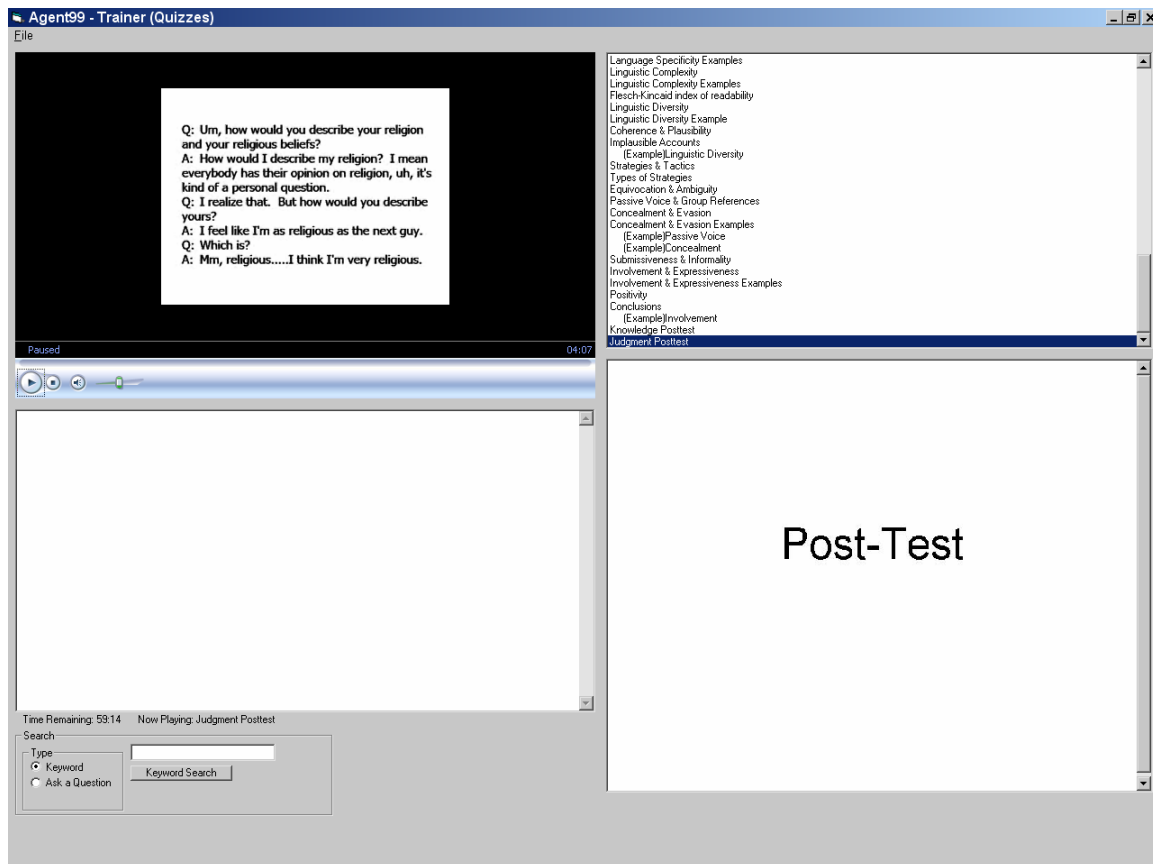


**Figure 6: Session Two Pretest Screenshot**

Transcript of text:

Q: What events do you remember most about your childhood, fondly?

A: That's really kinda hard to say. Um, I think that my fondest memories of school. Um, and growing up in a school environment. Those are my fondest memories. Um, you know, I think highly of my parents too, and that's a real fond memory. We had a close relationship.



**Figure 7: Session Two Posttest Screenshot Page 1**

Text transcript:

Q: Um, how would you describe your religion and your religious beliefs?

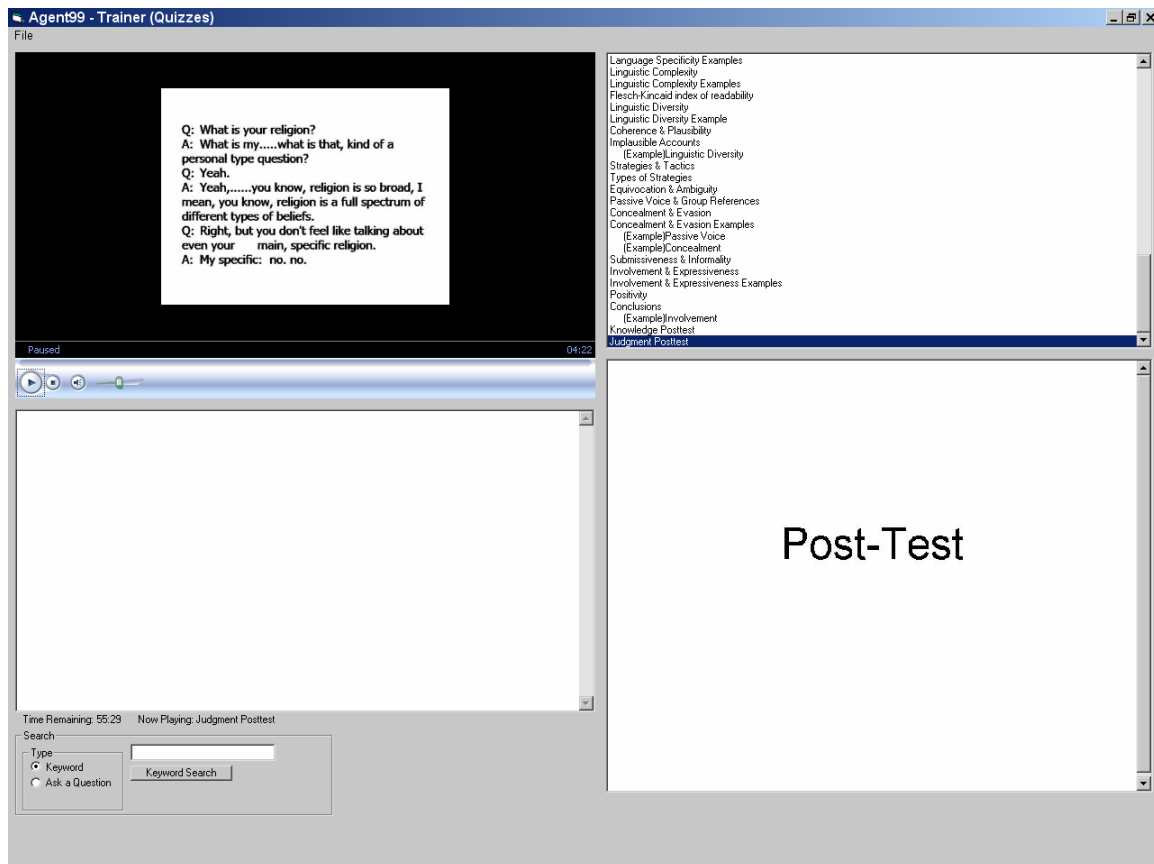
A: How would I describe my religion? I mean everybody has their opinion on religion, uh, it's kind of a personal question.

Q: I realize that. But how would you describe yours?

A: I feel like I'm as religious as the next guy.

Q: Which is?

A: Mm, Religious.....I think I'm very religious



**Figure 8: Session Two Posttest Screenshot Page 2**

Text transcript:

Q: What is your religion?

A: What is my...what is that, kind of a personal type question?

Q: Yeah.

A: Yeah,....you know, religions is so broad, I mean, you know, religion is a full spectrum of different types of beliefs.

Q: Right, but you don't feel like talking about even your main, specific religion.

A: My specific: no. no.



## Appendix C: Agent99 Usability Questions/Comments

### 1. Please describe any problems that you experienced using Agent99 Trainer.

I found agent99 to be an effective training platform; however I did not connect with the material being taught to the level where I feel confident discerning real world deception. I believe this is a useful training instrument and would like to use it more and learn more about detecting deception.

At times it moved too quickly to really learn the information. I am not a very fast reader so I had trouble making sure I read all of the words on the screen when they were there.

The written portion of the examples was too fast and did not allow enough time to read them. I was required to skim instead of ACTUALLY take in the information. This training is not the caliber of what I would suggest using for quality purposes. It is a mass training method that lacks the necessary interaction of an instructor. This program could be used for review methods but not as a primary means for instruction.

Sometimes the reading screens moved through the slides too fast for me to read them accurately.

The program itself was not well written; it had problems with synchronization and robustness. The attention to details was low, for instance there were over sized screens and empty choices. I would suggest having someone with actual programming skills write the application.

The video window was too small. The poor quality of the example videos made it difficult to tell who was talking right away.

I had to do the last set of questions twice and then only when time expired did everything properly continue

The video, notes, and lecture synchronization were off. Sentences would end before the lecturer was completed making his statements. The lecture notes did not match the speaker's words. Several screens towards the end of the session did not present any information. Received errors.

At times the reading was gone before I was able to finish it. Either build in a longer time to read it or make it so the person can advance it him/herself

Some quality of the text within the written examples was poor at times and often it moved too rapid to the next section.

Using headphones is irritating. My ears hurt after the first 20 min thus making me less likely to pay attention to the lecture. I removed them several times to get some feeling back in them.

The program didn't initialize on my first attempt.

No problems, use of program ran smooth.

Occasional "cannot display internet explorer page" pop up messages

Some audio/video stopped short

At one point when using the trainer, the next section did not come up and some of the files needed to be re-copied from the CD. Also, a few of the videos cut off before the end.

Some of the video/audio clips of the lecture cut off before the lecturer completed what he was saying. The examples where I had to read the transcripts of conversations went by too fast... I forgot about pausing the program and I didn't want to go over time.

I found that if I missed something or wanted to hear something again there was no way to go back or "rewind." Also, on the reading examples the slides were often changed too fast. It would be helpful if there were instantaneous feedback on the quizzes so you would know if you answered correctly or not and why.

Sometimes the videos were clipped so that I had to read the text to get all the information. The audio was a bit low during the examples and could be normalized a bit. The transcripts were hard to read at times.

When the transcripts of chat sessions or conversations came up I didn't have time to read them.

Um...Well. It went kind of quickly on some sections of the lecture. With the whole time thing going on the bottom, I uh... felt as though I should push on with hopes that the material I didn't fully grasp wouldn't be testable. I'm pretty smart [close to being genius] but some sections went too fast. I'm.. umm... not sure on what section that happened. I umm... think it was somewhere in the middle.

The written examples I had to read went too fast. I was trying to examine the details of the written Q&A sessions, but they jumped to the next part before I was actually ready. I purposely read slower to try and see if anything particular stood out. It would be nice if the user could manually change pages when they were ready.

I had some trouble with the slides changing before the speaker was done talking. Some of the text examples had too much text to read before the slide changed. It would also be helpful if we saw some of the answers to the questions given, like practice questions.

The text was distracting since it did not always match what the person in the video was saying.

One of the questions that used the word excellent misspelled the word excellent.

There were times when I would have liked to go back one slide to re-play it but I didn't know how.

Volume was inconsistent with videos / audio.

Audio levels had to be adjusted for the difference in examples and lecturers

I encountered no problems

Being that I was tired, it was hard for me to really concentrate on what was going on. I believe if I weren't tired it would have been easier for me to keep up with the lesson. Had it been in a regular classroom type lecture, I would of felt a bit more apt to concentrate as to me a teacher or instructor gives me a sense of "material" importance. Other than that, I liked Agent99.

I did not experience any technical difficulties with the Agent99 Trainer itself; however, I did find it difficult to follow the explanations of what to look for to detect deception. It will probably be more effective if the presenters explain the different methods one at a time and then show visual examples -- video or audio -- immediately

following each explanation. I think this would help me to more easily identify what to look for when determining if someone is being deceptive.

I didn't have time to read and completely grasp the situations before the screen automatically changed.

None, I think I would like the ability to press ahead of some of the videos. Maybe review parts of the videos. And sometimes have the ability to skip parts.

This 'deception' lesson and 'agent 99' test was too long to be sitting in front of a pc with headphones on

Nothing with the trainer....just the air-conditioning was SO COLD!

Slides that needed reading progressed faster than normal reading speed. Speech processing speed needs to slow down

Video cut short on the lecturer on a couple of occasions.

At the end of "Effect of Warning in Information Manipulation", everything stopped and I needed to ask the instructor for help.

1. The time given for the reading slides was too short.

Sometimes the lecture audio would cut off before the Power Point slide changed. The audio portions varied in volume so I had to keep making adjustments. Some of the sound clips sounded muffled or had a little echo due to the room it was recorded in. No offense against people with cleft palates, but the female with a cleft palate was hard to understand.

The trainer did not bring up the file list on initial opening. The different volumes of the voices are very annoying. The examples at the end did not play.

Too much information on the slides, script was not accurate to what were actually being spoken, and the video cuts off at end of clip before finishing all that was supposed to be said. Examples never told you whether you were right or wrong, no feedback for the student using Agent99 on whether he is actually learning

For slow readers the Q/A slides were a little fast and the audio and video in some parts ended too abruptly.

Some lecture videos were cut off before all info was passed on

There were a couple videos where the end got cut off/interrupted and another video started.

Topics should be grouped so they are easier to find if the user needs to go back and review

Some of the audio clips were "choppy" or cut-off before the speaker had finished talking

The program locked up after Deception and Communication Media and I had to go directly to the Post test. I didn't use the keyword or ask a question feature because I barely had time to get through the training at the pace the system automatically moves.

Some of the text did not match the audio words of the instructors. That can be somewhat distracting.

Some of the audio was cut off when they switched sections. The only other problem was that many of the things taught as deception cues are normally used by me and many I know when communicating normally, which makes it a bit more difficult for me.

The extended time it took from going to one question to the next was very annoying.  
I HATE popups

Not being able to replay videos and audios during the test made it hard sometimes because I didn't always hear them well enough.

The video would sometimes end prematurely and go onto the next subject without warning, sometimes cutting off the end of the lecture.

I had no problems.

Some of the videos and written text were not the same which made it a little hard to follow at times.

The Interface and the concept are "on the right track." I enjoyed the interface and found it very useful but, it needs a few technical refinements. For example, there were a few small "slow-downs" while the program moved from one video to the next. Also, a HELP Utility could be integrated for those simple technical and operational questions related to Agent99 itself. My congratulations on the Agent99 concept, it's the best hybrid between CBTs and the classroom environment I have seen so far. Keep up the good work...

If you have not yet answered a question, you cannot flip between the question window and the lecture.

Sometimes on the portion of the lecture that I had to read, there was not enough time for me to read the slide before it went to the next slide.

The GUI is just fine

Some pauses in the video.

I thought that the video screen should be larger, and the examples should be given head on instead of profile shots of the individuals interviewed. I also believe that the text examples should be scroll based instead of timed.

Some of the lectures would get cut off before the speaker had finished. Additionally, the script (below the video display) showed more verbiage than what was mentioned in the video.

I attempted to use your Keyword search on one occasion with no success. It could be because I attempted during the quiz. Also, it would be beneficial to have a video/audio tracker to allow for you to go back to the beginning of a lecture.

The issues that I have are not "problems", but mainly suggestions. The script below the speakers did not always follow what was being said (or visa versa) and I found myself concentrating more on what wasn't being said and wondering "why" rather than following the lecture.

I wasn't prepared for the variety of questions; text, audio, video. I also feel that the text questions move too fast to be read.

On occasion, I lost interest due to over explanation.

Some of the video clips moved too fast. Way too much going on the desktop. poor video quality on some of the clips

I did not experience any problems. Overall it's a good program, but I feel the information was extensive in nature.

Occasionally the voice cut out, but quickly returned. At one point the video froze and I required technical assistance.

If I selected a different topic, the slide screen in the bottom right corner did not always follow. Also, there were two video examples that did not function...they were the two before the short latency examples.

a lot of information; some of the lectures went by too quickly. could have been more obvious exactly what the actors did that gave away they were lying & what the actors did that came to the conclusion they were truthful

Did not encounter any problems.

Some of the video was hard to see and some of the audio skipped when the instructors were lecturing. Overall the material wasn't bad. I just had to concentrate harder in some areas than I did in others.

No problems, but I assume that there are certain periods when we are allowed to go back and look for information..

We were instructed to feel free to skip around through the slides as we wished. After clicking on the summary slide I was immediately prompted to take the post-test. I was not ready to take the post-test and didn't want to. There was no option to stop the test or to "back up".

It was a little difficult when the text didn't match up with what the person was saying. Especially if an entire paragraph was skipped.

Suggestion: provide whether examples are true or false to give trainee a better idea of example.

Varying of the loudness in the slides

The written transcripts went too fast

The example video quality was bad and the audio wasn't always understandable.

Cut off the speaker at the end of segments

The lag time for the pop-up questions was a bit annoying

It was strange to have the instructor audio cut out before it was done with a sentence and sometimes questions popped up when a video was going so I had to pick a choice so I could concentrate on the video, but other than that it was an excellent program

As a computer science major, I found that it was difficult getting started up. I am used to filling out forms online and it was cumbersome at the beginning

Sometimes the audio would cut off during the presentation

No real problems. Just noticed that the video and the slides were a little off sync.

The next slide would sometimes cut off the video that was playing before it was actually done.

-Sometimes the questions were confusing from a grammar standpoint.

Fatal error. A progress check question was on the screen and the system asked me if I wanted to take the final test now because I was running out of time. I clicked yes and then tried to answer the progress check question. System locked and showed the fatal error message. Instructor had to restart program.

Received error while using the program. Also, when I tried using the keyword search, it tried to install some items from office. Both of these interruptions took my focus away from the training.

Error message, had to correct and log back in.

Had a run error during use

Had a runtime error.

The text only examples were not on the screen long enough for me to completely read the scenarios.

The video would cut off the last sentence, and the slides would move too fast when I was trying to read them. You should be prompted to move forward to the next slide.

Was unsure when "Keyword" or "Ask a Question" section were available. it would not allow me to use it while some videos were playing  
audio was skipping at times

Some of the text-based examples went too fast. I prefer to re-read the text to make sure I understand exactly what was being written. I, therefore, may have missed important parts of the text and was unable to answer the question of deception accurately.

The embedded audio volume was a little high at times. Some of the video examples were a little too grainy so looking for physical clues was difficult at times.

At one point, a question popped up before the lecture had stopped. I missed what the lecture had to say while I was answering the question and the program would not allow me to pause the lecture.

Sometimes the video portion would advance before it reached the end of what was included in the caption portion.

Program would jump to next topic before completing the last.

The video feed stopped working during one of the lectures. We paused the session and it started working again.

One run-time error caused the application to close during one point of the program. Agent99 is the best CBT format I have ever used. I hope all of them start working like this; it beats death by power point anytime.

- Pop Questions would appear a second prior to the video clip actually finish.

The timing was a little off with the questions and the video. The question would pop up before the instructor was finished.

Experienced a run time error during the program.

In one section I was shown several clips and asked to make a determination of truth or deception. After the program said something like 2 and 4 were truthful (or dishonest). Anyway, I had seen many clips by that point and they were jumbled in my head. End result was I did not know if I answered correctly or not. No positive reinforcement.

Could not utilize function to "go back" or listen to lecture or example audio & video again if one existed.

## **2. What do you like about Agent99 Trainer?**

How it easily presents information; audio and visual are tied together for interactive training which is entertaining.

Video examples.

I think it is a good idea to be able to teach classes by video like this. The question boxes worked well. I like being able to integrate user input quizzes and the lecture information so that there are occasions where the user can cement their learning in the midst of the lecture.

The video examples. They showed the characteristics described right before.

It was easy to use and continued without me having to do anything.

Nothing

I like having the ability to pause the lectures and other parts at any time.

It gave an interesting approach to the subject matter.

Easy to use

I think it has potential, but the format as it stands now is not impressive to me. There is too much information on the screen. Either provide the video lecture with overview slides or the written presentation, but not both. Get rid of the upper right box. Serves no purpose.

I liked that the possibility existed to move at your own pace.

I believe this is the first attempt at deception training that I have received.

Good video

It's a nice change from the routine classroom.

Pause feature

Examples.. and pre and post test

Video & audio samples

Easy

Looks ok

The video examples

It's very similar to a classroom lecture w/ PowerPoint. Would be much more useful for online learning than just video lectures and emailing between students/instructor. Allows students to learn whichever way fits them best, lecture, reading, or examples. Well laid out with and easy to use.

Some of the examples were very helpful... it's nice to have a transcript of what's being said.

Ease of use; concurrent video with text transcript and lecture slides

The text and video/audio together

It is a good way for individuals to have training.

Interactive was a nice feature. The scenarios were pretty true to life. More examples (video, voice, and written) would be nice.

It is user friendly and the quality was good. The examples given were also good and well encompassing

Convenient for fitting training into busy schedules.

The simultaneous slide and video/audio presentations. They aided the learning process, specifically in visualizing the examples and understanding the explained concepts.

The way it has all of the pieces working together

The ability to hit pause so I could read the text at the bottom left screen. I was able to re-read and review a couple of things that I might not have heard correctly from the audio.

The use of PowerPoint along with the lecture

GUI environment

Slides, lecture, and transcript all at once, this allows me to look away from the lecturer and view the main points on the slide. It also allows me to read a part of the lecture if I did not understand what the lecturer said.

Very interactive training tool

It had a lot of info at my disposal and it integrated the different learning medias.

I like its ease of use and the combination of audio and video presentation along with slide show and text. I think it is a good method of providing a lecture via a simple application package. I would recommend; however, to add a playback button to repeat any information that may be overlooked by the user.

Having the 3 methods going on at once was more effective. I didn't use it but I liked the ability to go to different sections at any time by using the top right screen.

I felt that it was a very good implementation and GUI for learning. The system was well integrated with the video and lesson aspects.

Integration of learning material and multimedia

Its interactiveness

Nothing

Well integrated.

Good combination of video and audio examples with lecture. Showing/testing examples in the beginning, lecturing, and then re-testing is a good learning method and a good way for the developers to determine the effectiveness of the tool.

Extremely easy to use. I liked the video clips. The examples were also very helpful.

Simplicity. I liked that I could read as well as watch the instructor. It was a great use of multimedia and I feel like I've learned more about deception. Everyone should go through this training.

Both Audio and Visual and with notes

The Media player and the examples

Something I like about it I also don't like. The different layouts (video, audio, and slides) make it easier for different styles of learners. On the other hand, I found myself trying to look at two different things at once and lose the audio.

Like interactive approach, attempt to incorporate multiple learning styles into one system, real examples of deception everyday

Simple to understand, easy to follow along

-Smooth integration of various media types

The integration of the all media forms

Video audio and text a good mix although when reading along with video and text did not match exactly I spent more time finding where to pick it back up and less time listening or understanding the intended message.

The interactive quizzes

Very simple

1) Video and audio examples. 2) Teaching with video, text, and PowerPoint simultaneously. Let's me quickly review points on PowerPoint, listen to instructor, and review what he said when I missed it. 3) Software is easy to look at. Eye friendly. 4) Control over volume and pause due to distractions.

I liked that it used not only audio and video, but that it integrated it with slides and transcripts.

Redundancy of the material in each section

Integration of multimedia



I like the incorporation of Topic, Notes, Slides and Video/Audio all at once - being able to focus your attention to the notes and read along with the speaker or look at the slides to get a good idea of where the speaker may be going with the topic is very useful.

It's very easy to use.

I like the visuals with the examples. It helps everything sink in.

Nothing

It has quick response times to choices the user makes

It focuses on all areas of learning. It allows one to backtrack and see sections again.

Ease of use, integration of video and slides, good outline and plan

I think it had some good information.

Self-paced

Lots of visual information that I can control while learning.

The synchronized briefing with the slides and text... The ability to jump to any portion of the briefing on demand.

It's very interactive

The Interface concept itself... It is the best hybrid between CBTs and classroom teaching I have ever seen. It would be an extremely useful tool for military and commercial teaching applications.

The 4 windows, the video with the text underneath. I like the arrangement of information.

The combination of way to learn the subject

Easy to use

It is simple to use

Video & audio use

All windows are open and if you want to interrupt the procedure or go back, you have that option.

It helped me to be a part of the classroom setting by:

I like the videos and the ability to maneuver within the program.

The integration of all media was very nice. I do not use chat rooms on the internet, and I typically find simple Power Point slides not detailed enough. Most CBT courses are taught in that chat room format or with simple slides. The lecture and script were great learning tools.

Having both the audio lectures with the slides and some examples all coinciding is a great idea. The quality of the audio video is more than satisfactory

It's attractive to all forms of learners. (visual, verbal, etc...)

Examples of what you are trying to teach are good

Video feeds and visual examples

Gave some specific cues to look for in regards to detecting deception.

The ability to review topics multiple times if I have any questions.

The audio and video which went with the slides. Also, the video examples.

I liked the video examples. I thought they were very useful. I liked them better than the audio or the read-along examples.

I like the idea of receiving deception training.

The use of video examples that followed right along with the lecture.

I could go pretty much at my own pace versus sitting in a room listening to a lecture

I liked the video along with the transcript... It's much better than audio and slides, or just the slides alone....

Multiple mediums of instruction should benefit people who learn in different ways. Unfortunately, you force all methods on the user at once. If I have already read the transcript of a lecture, why do I need to listen to somebody else read the rest of it? I learn better from reading anyway, it's really just wasting my time at that point.

It runs straight through, but there is the option of going back to any section in the program

Multiple learning styles supplied

The wealth of information available, i.e... one can navigate through, read, listen, watch, and see summary slides simultaneously.

I Liked the use of power point as well as the integration of audio and video in agent99.

Simple vb interface

Audio examples

The instructors were knowledgeable and clear spoken. The video quality for the instructor videos was quite good.

Video with slides and text

Examples

Uses visual and two forms of written to aid in learning

The visual instructor and being able to listen while reading or looking at the slides.

The integrated approach of combining all different types of learning techniques

The different mediums to learn information

If it had more real examples.

User-friendly

-I like that you can get your information from each type of medium. it is good for people who learn differently.

Gives you information in multi formats at the same time.

Multiple displays at one time: slides, video, transcript, and outline

Real examples

Easy to use. I liked having text that accompanied the video and audio, as the audio was sometimes difficult to understand.

Ease of use. Good examples.

It was easy to use

Easy to use.

It's use of the various learning styles (auditory, visual, and tactile) to keep me involved. I liked the pop up questions most.

Nice interactivity

I like the video/ slide integration.

Good examples and videos

The audio and visual examples along with text and the caption as instructors speak - I just wished it didn't skip audio every now and then

Self-Paced.

Integration of audio and text. The example videos were also pretty great.

Integration between the text/video/PowerPoint slides

I like the fact that you get audio, video and text instruction all in one go. The instruction coupled with the questions that popped up at times and the pre/post tests made the learning experience more dynamic and easier to comprehend.

Information presentation. Because of the various different ways you were able to see the information and review it; it allowed you to learn at your own pace.

The ability to see a slide, hear how one talks through it, but also see what the instructor said - both slide and textbook-like information is nice

I am a visual learner, and the video with the examples helped me understand the information better.

It was easy to use and very informative.

The video, slide and notes/commentary combine to give you the visual as well as audio aspects that reinforce the learning material being presented very effectively.

Well thought out, audio and visual stimulation (text and video) is a great idea. Not sure about the "search function" perhaps it is not applicable to this particular training exercise

I like the ability to see the text speech and the slides as well as the instructor, all at the same time.

The format (video & audio), with the instructors talking and the text displayed. Slides provided a good synopsis of the material covered. The table of contents made searching other topics easily accessible.

I liked the multiple panes with slides, video and text. If I got tired of looking at the speaker I could read the text or refer to the slides. A good way to keep students attention.

Interactive; gives theory supported by examples

### **3. What do you dislike about Agent99 Trainer?**

I left not feeling confident

No teacher/student interaction. Some of the examples did not necessarily clearly illustrate what was trying to be expressed.

I don't like the fact that there was no feedback on your answers. You answer the quizzes not knowing if any of your answers are right.

It is too vague and the written examples are too fast.

It was kind of boring and at parts I lost focus and when the questions came up at the end I had trouble remembering what was said earlier. I was unsure how to go back so I couldn't relearn what I had missed.

I just explained that the program is poorly written.

Not having the ability to go back a few seconds in the videos to catch something I may have missed.

Just going through things twice

I would have gotten more out of the training if after some the examples we went back and showed where the deception occurred.

Size of the window.

Too small and I prefer lecture in person versus a PC

More flexibility allowing a user to review a particular video again would be nice.

No written material (paper) that identifies key concepts

Looking at a screen for that amount of time

Nothing that I really disliked. I believe it's quality training

Too much info

Nothing

It was made using visual basic. Looks clunky

Video editing was rather distracting; audio split into stereo unnecessarily and was somewhat distracting; time to read slides in realplayer was not sufficient...often changed before finished reading the slide; video/audio cut out before speech was finished in a few sections; lack of introduction before diving into the details of the subject made it difficult to understand what it was I was doing.

Some slides where reading was required did not allow enough time for me personally

I dislike the fact that the recorded instructors are basically reading off the notes.

Can't think of anything.

No way to go back and listen to/see something again. No way to ask questions or interact.

Some audio did not match transcripts; final seconds of some audio segments were clipped

The video was clipped at points and the audio should be normalized

Needs more controls.

Not being able to control the speed of activities requires scrutinization of written examples. Video footage could be better.

The text window.

Some of the slides moved too fast and didn't allow the user to finish reading everything. The controls on the media player should be left in tact so that in cases where readers are slower than the media is set to then they can rewind or replay without having to start that portion over.

Nothing

There was no immediate feedback. I saw numerous examples of 'possible' deception, made my best guess, but then didn't find out if I was right or not until the end of that section. Hell, I can't remember what example one was compared to example 5 or 6. I found that annoying. I didn't know if I was picking it up well or not because it didn't tell me until the end: "example X & Y were deceptive, the rest were truthful".

Went to fast

Redundancy. Some video clips were cut short.

This particular lesson was too long. Thirty minutes or less should be the target.

Sometimes it went a little to fast

I personally do not like learning from computers. I just feel that my eyes get really tired and it makes me disinterested.

Again, I didn't like not being able to playback something I missed the lecturer saying. As far as the information itself, I did not like the lack of verbal examples from the lecturers and the lack of visual examples mixed within the lecturers lengthy explanations.

Certain topics like the one we went over require discussion and personal explanation to sometimes see complex details that aren't very obvious the first time you look at it

I did not have the ability to skip ahead. Or did not know I could skip ahead, review parts or scrub through the video.

Impersonal

At times the example slides with script when too quickly from one slide to the next.

Nothing

Very long...

Some of the sound quality.

Headsets

The only thing I didn't like is that the reading examples needed more time on the screen. I have a reading problem and needed more time to read and comprehend the example.

Size of video image made it pointless at times

Audio volume inconsistent and for the short audio clips it was hard to tell if someone is being deceptive with just a sound blurb.

I would've liked to been able to see if my deception detections were correct.

Slides are grainy

1) History of research at end is interesting. But if Agent99's purpose is to teach me better deception detection skills, then history of research is irrelevant. Also, Agent99 focused on face to face interaction. Very shallow review of deception detection in other mediums like email, video conferencing, etc. I would like to learn about these too.

Some of the video examples were hard to see and a little difficult to understand.

I think there should be instantaneous feedback for some of the videos. A voiceover explaining specific examples of indicators of deception as they occur in the clips would be helpful.

Not knowing how many questions there were

Not a huge problem, but I just let the program take its course - it would have been more helpful if the Topic section had updated as I automatically switched topics - so that I could know my position within the available material as well as a reminder of which subheading the current lecture fell under. Instead, it stayed on the "Introduction" for the course.

It doesn't keep my attention well since the screen with the instructors is so small.

The people speaking were kind of monotone. Nothing really wrong with that because it's a learning environment but it made me sleepy.

Too slow

It seems like technology that is trying to replace the classroom. I think the interactive classroom is still the most effective means of communicating information.

I cannot rewind the video

Some of the examples are a little iffy, could go either way, and much depends on the person who is speaking.

Latency and the popup questions

Not being able to replay questions

I couldn't advance through before completing the pretest

Nothing.

I didn't have any use for the Search during this training so have no opinion on it, but everything else seemed to work fine.

No feedback was given for the pretest at all. Also many of the tests were ambiguous. It is hard to detect deception when you have no context for a video or audio clip

The lack of a HELP Utility associate with the program itself. For example, I find the "Paper Clip" Help character in Microsoft Office very inconvenient but when I have a question about how to do or fix something with the program or my work it always has "tons of answers"...

Long

Becomes boring

This last test

Your tests were geared towards me detecting when a person was deceiving. I don't think enough time was spent on learning the detectors. I felt let down in that area, as though I was not given enough tools to make an educated guess

Kind of long

The video window seemed small. Maybe a higher quality would make the use better.

Overall, I had no problems with the trainer. This is an excellent tool for training.

Too much information.... Also, would like to have to know if I answered questions correctly during the quiz. I feel I'm smarter now, but I don't really know.

Again, issues with the topic selector not highlighting the current topic, and the script not being word-for-word with the instructors.

The biggest drawback is that the trainer doesn't seem reusable. When I say not reusable I refer to the lack of interaction. I would not want to sit through all of these slides.

Some of the modules offered an over explanation.

I have this overwhelming feeling of distrust towards everybody right now. Going to throw up way too many false alarms.

Too lengthy, not enough time looking at one deception attribute

Took too long to get the point across.

I have no complaints when comparing this learning technique to a standard lecture.

The video quality was a little poor.

I don't like that you cannot go back on your test questions or these answer responses. It is also difficult to just go back a little bit on your slides and examples when I can't read-along as quickly as the slides move...only happened a few times.

Some of the lecture was too fast. Could have been more explicit during the acting scenes.

The fact that I was not given any feedback on either the pre-test or the post-test. I would have liked to have been told if my answers were correct, and if they were wrong what the correct answer was.

It didn't display what the average answer was or what the textbook answer should be

While there are good things about having all of these features combined into one application, it is bad to have to use it with no breaks. It can be difficult and tiresome sitting in one place staring at the screen.

You force all methods on the user at once. If I have already read the transcript of a lecture, why do I need to listen to somebody else read the rest of it? I learn better from reading anyway; it's really just wasting my time at that point.

The UI isn't visually appealing. It's bland.

Some of the audio clips were hard to understand. Also, when a reading question was asked, the trainer moved on too quickly.

The transcript portion of agent 99 did not completely match with what the audio was saying. There were whole sentences missing and that caused me to lose my place/train of thought a couple of times.

The video slides and the keyword... too much... It would be easier to visually accept if less crowded

The verbal reading of the instructors, at times it became a distraction

Lack of interaction. Still feel unsure about deceivers unless is very obvious fear or equivocating.

Too slow

Poor video quality in examples

There was a loud beep after answering some of the questions

Video guys talk too slow, should be an option to watch the video or to end it if you finish reading the material early

Sometimes it went too fast for me to really comprehend the subject, but I could always go back if I needed to

Feeling like I was timed

Nothing

It seems impersonal and a bit "campy" sometimes.

Video a little choppy in places. test questions are slow to change once you have answered the question. It would be nice if the list of sections showed which section you were on so you know how far you had gotten in the training.

Nothing

I would have liked to know what section I was in. I was not always sure (by looking at the selectable section area) where I was. I would have liked to have a "Next" button instead of it automatically advancing. Sometime I wanted to reread a section.

That I had to use it

Information not being displayed in a timely manner.

Nothing

The limited time for the text examples.

Would like a lot more examples and immediate feedback on whether or not my ability to detect deception was accurate.

The overview top right box should be a drop down menu. It takes up too much of the screen.

No breaks between sections; made navigating at my own pace un-easy

It's moving so fast and it is timed - I'd like to take my time with it, pause it when I feel like it, and think about the info that was given to me. also being able to replay the info given to me - it seems it was going too quick for me.

Nothing.

Sometimes the lecture portion did not match up with the text in the bottom left screen. I found that to be distracting.

Nothing really.

I would have preferred to not have had a timer on and also to have had an opportunity to review my previous responses and what the correct answers were.

That you have to view the instructions on how to use it every time it starts up.

Nothing

Fact that I was unable to complete the entire session because of the time constraints.

The right-hand window that shows the course outline needs to highlight the slide / presentation area being presented by the video and slide areas.

App Crash

1. Modify the UI:

The video or audio feed cutting off before the lecture appeared finished.

Several examples used a transcript version we were supposed to read. The information automatically advanced and several times I was unable to read all of it (I am a slow reader sometimes). I surmised this might be intentional to avoid giving an inordinate amount of time to analyze the statements.

Would like a "go back" or repeat function on certain slides; otherwise, I'm very satisfied with the trainer.

#### **4. How can Agent99 Trainer be improved to better help you learn?**

Better define when people are lying

Larger video size.

I think feedback on the questions that popped up could be very useful in most situations. More freedom to slow it down or speed it up might help.

Decrease the speed of the written example scrolling. Please also provide more descriptive terminology concerning the instruction

I am not sure, a little more interaction would help. For example, when showing examples allow for a function for us to choose if it is deception or not and then tell us the correct answer and explain why.

Get someone to write a good program with UI amenities that work.

Make the screen bigger; input the ability to go back a few seconds in the video.

Don't go through things twice

By breaking down some of the examples and actually showing the deception.

Fine tune it.

Full screen view

Add more control over the video. Some moved too fast and some was not too clear or easy to understand... I would have liked to rewind and watch again.

Instant notification of wrong answers and why they were incorrect

Increase the size so it's easier to view

Highlighted key words in text

I don't know, it seems like I already knew this

Don't know

Use a better GUI interface. Have the video part zoom in or something instead of being small and separate.

Can't think of anything.

"Rewind" button, instant feedback on quizzes, use actors instead of professors to read the transcript... they would be better at keeping the student involved and interested

More concrete examples of lying and such



Explain a little better before jumping into the next topic or activity. I felt like it should have been made clearer when it was test time what exactly you were looking for when answering the questions. Like once, I thought what the person did was deceptive but it seemed as though she was telling the truth.

Refer to question 1's answer.

More examples. Maybe add a couple of more quizzes.

A quick tutorial so that users know what they can and can't do. For example, I didn't touch anything during the training in fear that I'd have to start over...later I discovered by the questions asked that this wasn't the case.

On the video examples show the people's face with better lighting.

Slow the pace down and have a short review in the middle of the lecture

Shorter, less complex lessons. This would be a great system for those types of subjects.

I believe the program is a great tool

I feel, overall, that it is a great learning tool for those that can learn from this type of media.

Break the lecturer's information down some more and include more verbal and visual examples as the lecturers describe the different scenarios.

More examples and more detailed and specific explanations on the examples.

I like the multimedia aspect. The instructors may be more dynamic if the video was shot with them teaching in front of a group.

Larger screen (video)

One aspect, slides or lecturer, not both

Have nothing other than traditional methods of slides to compare to. Nothing...

Show more examples during the lecture as individual topics are covered....point out aspects of the scenarios that illustrate the topics being covered.

Be more consistent... The text in the bottom left hand corner didn't always match the audio in the video clip. That made it somewhat confusing to try to follow along with the text.

Improve sound quality.

Larger video screen

After answering a question I would like to see the answers before going to the next slide

Make it adaptable for each individual. I would cut out the text below the video screen to prevent myself from looking down there. I could then concentrate on the audio and the slides.

Slides need to be more concise and information about what is being said needs to be revealed a little at a time on the slide (animate the slide with the video); feedback on how the user is doing

Answered on the last question

More video/audio examples after definitions and explanations.

Place pauses between lecture sections to allow review of the lecture.

1) After giving examples of deception and truth, list the indicators. For some examples, the instructor says it is deceptive, but does not state why he thinks this.

It needs better examples.

Make the lesson (slides/instructor) a larger part of the screen. Make the show require more interaction to keep moving. It's easy to let the trainer move automatically and then the student loses interest and is less likely to pay attention.

I cannot really think of a way to improve because I don't think there are really any improvements to be made.

Speed up

None, it is effective. I just think that sitting in front of a computer can sometimes be demotivating and distracting.

A rewind option for the videos would be helpful to re-play just viewed segments

A few more examples, maybe try and find more cues to look for

I could care less about the history of the research of deception. keep it simple and brief. Give me the tools that I need to detect deception

Make it so you can replay the questions

Improve navigation features to allow advancement in any stage of the application

More examples

Pull Video for instructors; more feedback on answers given

Small Interface cosmetics changes (font, screen size, resolution, etc.) as well as a few more control options and menus.

Have not used it enough to answer

No more in depth on the "how to detect". You gave plenty of info on the background and introduction but the meat of the lesson was not enough

Not Sure. Overall, pretty good.

Video shots should be head on. Would also like to see if my answers were correct or not.

If there were a way to take notes or highlight items throughout the training. For example, some way to be able to bookmark or insert notes for future references.

Reduce the amount of information in the program. I realize there's a lot to be delivered, but take it in phases. Also, insert an answer key to show results after the quizzes.

I think it is already a better tool than I have seen used in most training environments.

Add some interaction such as many examples that individuals can go through on their own. Also placing more instructions before things like these answers because I was unaware that there would be more than one text box until I saw the person beside me was on question 3

Aside from the cutting off of some of the audio feed, I think that it is an excellent program. It is very user friendly.

Simplified a little more; a little slower pace

Split the lecture into smaller sections. Give more visual examples and remove the sections that had no visual or audio

Cut down on time involved. I felt that some of it was repetitive.

Addressing the voice problems I experienced would help.

Reoccurring use...

Get rid of some of the extras on the viewer and add a "go back" button.

Once again tell me what the answers to the questions are so that way I can look back and see what observations I missed in my assessment.

Have more quizzes during the lecture versus at the end. Point out this is what majority people do when deceiving but some have perfected the "tell-tell" clues more than others

Have a pause after a few lectures, include a review period or some time where the student can go back and review information then continue where they left off.

Rather than using a single form, place each instruction medium in its own resizable window so users can increase the relative size of the information that most interests them. Also, allow the user to control the speed of slides. Many flipped before I had finished reading them.

Give more training and more experience

Provide more examples of truth/deception for cues

In my opinion the word search/ask a question is not needed in a timed situation but if you are using agent 99 in an untimed situation I could definitely see the benefits of using the word search.

Less clutter

Better video examples

Include more commentary that points out the signals of deception

Not too much more than suggestions already stated

Have the written script scroll when the instructor speaks beyond what is on the screen just to make it feel like you aren't doing too many things at once

For the reading examples/scenarios, don't assume I read that fast before going on to the next thing

Nothing

I'm not sure. I learn best when I'm interested in the subject matter.

Slow down the slides that I am supposed to read or make so that I can change them manually. Remove the timer so that you can complete the entire training.

More memory to help stop delays.

Maybe more examples

Test the software better.

Give more time to read the examples.

Maintain the same volume levels on all the video examples, lectures, and audio playback.

Check out some of the Defense Acquisition CBTs: ACQ 101 or SAM 101. They are very interactive and enhance learning in my opinion. This CBT was a little primitive in nature. The top right box should be a drop down menu. The text on the bottom left next to the slides on the bottom right is kind of distracting especially when you can't advance or slow down on your own.

1. Break between sections or prompt to move on to next section or choose another section.

Not time it

Louder audio volume.

Match the text to the lecture exactly. Other than that it was put together very well.

Works fine for me just the way it currently is.

Allow the user more control over the entire module except for the posttest. I did not have the opportunity to get through the entire module due to problems with a pop up window overlapping a lecture.

Maybe take away the chapter overview part - I tended to look at it to see how much I had left to view, so it was a bit distracting.

Larger video area and remove the narrative from the screen.

Remove the time constraints which will allow everyone to complete the session and receive the full benefit of the information being presented.

Integrate it with all of the Air Force CBTs as soon as possible.

Improve videos

More examples and feedback to know whether you have/have not detected deception correctly on examples.

## **5. In what learning situations do you think you would like to use Agent99 Trainer?**

Professional military development for new supervisors or at any managerial training

Only when no teacher is available.

It might be good in place of our current CBT training

Training

None

None.

Not sure

It would do a better job than CBTs

Short discussions or training classes. A 60+ minute briefing is too long to stare at a computer screen.

SATE training and maybe some of the COMPUSEC and LOAC trainings.

None

It would be a better classroom supplement than the standard CBT, so replacing a few of the old ones with this program would be helpful.

As an option not to go TDY for the training

None

Any form of training not requiring hands-on

Don't know

Free time

Topics where examples and interviews need to be shown a lot

Online classes or training from a university, replace the current CBTs that the AF uses with Smart Force. Perhaps implement more computer-based training using Agent99 in place of some TDY training in BCOT or ASBC.

Distance learning perhaps as a supplement to a course--I would definitely prefer an actual classroom setting though

Simpler lessons

I do not know

If I could use Agent99 Trainer instead of going to BCOT for three months, I choose Agent99.

Day to day operations. Supervisor/trainee relations.  
 Online courses, CBT courses or Defensive Driving (Traffic School)  
 Military or educational (off-duty) training.  
 Situations like the one presented here (deception). Video examples of stuff with immediate analysis of right & wrong answers  
 Any  
 PME  
 Annual training such as Law of armed conflict, different safety training, etc.  
 Annual Air Force Training Courses  
 In conjunction with class lectures. Sort of like a compliment to course study.  
 For an online course. I think this is an excellent way to conduct distance learning courses; however, there should be an option to be able to actually communicate with an instructor for more specific questions.  
 I don't think it should be the only way of teaching. I thought it was effective but as a whole I have difficulty staying focused on computer based training. I think it would be best used as a supplement or a reference to lecture.  
 Here is a good idea. In my current technical class, have the class initially taught in person. Allow the student to use this system to refresh or go over information again at his or her choosing. Also I like the idea that the system can be web enabled.  
 None  
 Those where traditional classroom teachings are not available, such as remote college courses.  
 Specialized training on deception  
 Obviously, a human instructor is always preferred to any CBT, but this program was very easy to use. I can imagine using this in any number of situations.  
 1. Any subject matter requiring video  
 It would be great to reinforce traditional teaching.  
 Any  
 The setup today work out great  
 I think it would word great with learning new tasks as long as the individual could get some sort hands-on while going through the training.  
 Learning from home, correspondence, CBT  
 Any; this is much better than a CBT  
 Situations where the DoD is paying an instructor to be static at the front of a classroom and lecture the same material.  
 I find this would be a great application to build CBT lectures for upgrade training and AFCS specific training within squadrons  
 Counseling situations  
 Long distance/correspondence  
 Information assurance sensitivity. AF examples showed how a spy/thief/conman may try to get information and escape when someone finds him.  
 As a basis for deception training.  
 Any CBT training  
 I can think of a lot of applications - some things that are already CBT, but would be better if incorporated with Agent99 - such as the annual LOAC, Anti-Terrorism, or ORM

training. Basically, this is the best CBT platform that I have used and would be willing to use it for any training that could be computer based.

None, I prefer lecture from an instructor/trainer.

None

Basic/Intro Courses

CBTs

In learning information within limited time constraints. Also, it would be useful in deployed situations where we may need to learn information in a safe and efficient manner.

In pretty much any

Special ops

Online college courses. On the job training.

Online college course work, CBT training, Annual safety, suicide, or other general briefings.

None really

I believe it could be use for any training and learning activity that does not require physical interaction (labs, experiments, etc.)

Most CBTs for example, CBTs for Cisco etc

Reoccurring training

Opsec, compusec, and comsec training

LOAC

CBT at my base or you come TDY and do the class

On-line

One on one and voice recognition training

1) Refresher training

I would like to see it in New Comer Orientation for bases. I think it would be beneficial to employees.

I'm planning on getting my Master's Degree via on-line learning and I imagine coursework taught through Agent99 would be easier to understand and lead to better results than other types of media.

On the job training.

Home base, not at BCOT

Anyone can legitimately benefit from the program.

For quick, one-time courses that would normally take only a day or so. I'm not sure I would prefer this method of learning for longer-term courses.

Initial and annual training.

I'm really not sure. The only thing that really comes to mind is to ensure proper training, especially when dealing with OPSEC, COMSEC, and COMPUSEC.

Probably in a customer service situation (the day to day interaction)

Short CBT in my job would actually be a good place for these. Especially when the student would benefit from examples...

In conjunction with a class

CBT

Air Force training requirements. Although, it should only be used as a tool along with lecture.

I think it would be incredible to use agent 99 for ROTC cadets just before the commission to use this and give them a complete breakdown on how to in process at their base and also give them a good understanding of the base they are reporting to. On active duty, probably for financial counseling for those in need of it.

None

Interactive lecture

Prefer face-to-face interaction.

Language

Learning new languages

As an introduction to IA and security for all personnel (i.e. all personnel at AFSOC should take this CBT online)

Subject material that takes a lot of examples to understand it

Basic or 101 course.

Not sure. Perhaps step by step computer work using examples.

At my desk at work

All

Similar applications to the deception training.

CBTs

Upgrade training

To replace the current CBTs

Annual training

Pretty much any recurring training.

In an at home-based environment where I can take my time with it, stop and replay info as needed

I'm not sure.

One could put the entire BCOT course in an Agent 99 trainer and save millions of \$\$'s

For new personnel, say basic trainees or tech school students. Coming from an Intelligence background and working with classified material this trainer would make life much easier on trainers out in the field. Getting a trainer like this to train personnel would strengthen security awareness and help teach some valuable skills need in the field.

I think it could be used for a number of various programs job specific as well as example based, because it allows the person to review items as well as focus examples. I can't think of any specific type of area where you could not tailor this type of program to deliver the necessary training.

For short subjects, periodic training on specific topics.

This is good for all situations I can think of.

Agent99 trainer would be good in any academic setting.

Any computer based training for computers, on-line classes, correspondence courses, etc... it would be very useful in all of them.

Like "FYI" info, I believe important topics should be emphasized with a CBT and then discussed in person (group environment preferably)

In pretty much any CBT course.

Computer training, network information, Information assurance, Security awareness

It would be useful for people who are responsible for protecting information and resources (security, SCIF, controlled area workers). I do not think it would be appropriate to disseminate the information widely to the general population of the military.

Initial and recurrent deception training (similar to AF Info Awareness training).

## **6. Other comments:**

If additional features were built in, it could prove a very useful additional training tool.

Have the pop-up screen automatically take advantage of the entire screen size

This was pretty fun and very interesting...great job!

I think that this is a good idea to teach people how to judge others.

Overall felt that this is a great program. Having been a sluggish day for me today, I felt that it just added more to the feeling of being tired.

I think Agent99 Trainer is an excellent tool that is easy to use and conducive to learning, especially in an outside-the-classroom type course. I also found it quite enjoyable.

Good job on the system I really liked it.

While taking the test, could we look up the answers? Based on the usability test, it appeared so. However, I don't remember that being explained.

The program itself was extremely user friendly and simple to use, but the monotone video was somewhat boring. Also, it would be helpful to have more explanation of the example video clips... Not having any prior experience with this, it would have been useful to have an explanation of what I had just seen after some of the clips to point out some of the things I was supposed to be looking for. Overall, this was an excellent program.

Maybe slow down the topics a little more in case people want to take notes

Is this for learning deception or are you trying to get feedback on Agent99?

Nice try

Good job! Looks like you did a lot of work in making this.

Be careful not to have TOO much info, as in length - I was starting to zone out near the end because of the constant flow of information

It would be nice to be able to change where the video is playing; if you missed something then be able to back up the clip a couple seconds

give more time to learn and understand

Pop-up screen very irritating

Great product.

Well put together software with only a few glitches. I can admire the work put into the program itself; however I feel the content needs more development

Overall this training tool was very user friendly and easy to navigate. I hope to see this in future Air Force technical training school courses. Maybe even one day be allowed to attend Air Force technical training from home. By doing so it would allow families to stay together and not have to be separated as much. If it was to be used to



train in this way, the test could be conducted at the local bases and e-mailed, faxed, or mailed to the appropriate school for grading.

During the videos, the Lt offered too much information to an individual who knew nothing, i.e... names of meetings and things of that nature. The information he provided alone was enough for the intruder to possibly use on another member at a different location.

Good program overall

This would be good for supervisors and managers to take. It would help them identify dishonest subordinates.

Overall, the information was good. I enjoyed taking the test and it gave me some tools to help better identify deception

My only other comment is that if you use examples that require the user to read the example set it up so that when they are done reading the page that they can click a "continue button" and read the next slide when they are ready. People don't read at the same speed and I missed a couple of the lines a few times.

Excellent program overall

Overall good experience using the trainer.

Before implementing any CBTs in this format, look at what the Defense Acquisition University has in place for their computer based classes. They have some great tools available for students.

Good content and a lot of information.

I thought it was very interesting. Where can I purchase or retake this course without having to rush or being timed?

It was an interesting experience.

All in all very good training. the environment leaves a bit to be desired. My fingers are frozen and I had a difficult time concentrating during the final portions

The last thing I would have liked is to have had was a better idea about how long sections were and/or the number of questions I would be expecting to answer for timing purposes.

Great idea, program interface looks dated, but once polished should be a great tool. (a standardized interface would be smart; the AF has too many systems that do the same thing). Thanks.

With reference to the deception course:

Great Job...Good Luck

Nice simulator-I feel it has real value for deception detection efforts; especially the "real-world" scenarios you are likely to encounter in an NCC with contractors/support personnel on a daily basis.

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## **Vita**

Capt Ford was born in Pensacola, Florida into a career Navy family in 1964. He graduated from Mount Ararat High School in Topsham, Maine in 1982 and worked in the civilian community for a few years. In April 1985, he enlisted in the Air Force and began working on his bachelor's degree in 1987. He excelled in his job and was promoted above his peers achieving the rank of Master Sergeant in less than 13 years. During his enlisted years, his pinnacle assignment was with the National Security Agency where he earned the Defense Meritorious Service Medal. Within two months of his promotion to Master Sergeant in 1998, he completed his bachelor's degree in Computer Studies and was accepted to Officer Training School (OTS). Capt Ford graduated OTS in September 1998 with the William Shakespeare award for writing. Upon graduation from OTS, Capt Ford was assigned to the 16<sup>th</sup> Communication (Comm) Squadron, Hurlburt Field, Florida. Among his duties within the Comm Squadron, he was the Information Assurance Officer for the base, ensuring the base network was free from malicious attack and weak security. He was also the 16<sup>th</sup> Support Group's Officer in Charge for preparations for the Y2K event. In September 2002, he was reassigned to the 25<sup>th</sup> Information Operation Squadron at Hurlburt Field where he was the Mission Support Flight Commander. In this position, he was responsible for ensuring Special Operation's Information Operators going into harm's way were sufficiently supported to minimize the risk of loss of life. Capt Ford then proceeded to the Air Force Information Institute of Technology at Wright Patterson Air Force Base, OH where he entered the Master's program in Strategic Information Management. His next assignment will take him to Keesler AFB, MS where he will be an instructor in the Basic Communications Officer Training Course.

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